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WORSENING RELATIVE WAGE DISPERSION IN CHILE DURING TRADE LIBERARLIZATION: SUPPLY OR DEMAND DRIVEN INEQUALITY?

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Executive Summary

I examine household surveys for greater Santiago, Chile from 1957 through 1992 to determine the path, trends and causes of the wage gap between more and less educated workers, or "relative wages". While it is commonly argued, following Heckscher-Ohlin[1], that trade liberalization leads to the compression of wage differentials across educational groups for a given distribution of educational supply, theory is indeterminate. "New" growth theories postulate that trade liberalization increases relative wages by making knowledge more productive. Good empirical evidence remains sparse. The maturity of trade liberalization and the presence of labor market data for Chile afford an important opportunity to study this question.

Previous work used regression techniques applied to data that does not cover the mature phase of trade liberalization. I extend the analysis through 1992 and confront the methodological shortcomings of earlier studies. This study begins by using standard regression techniques to examine the pattern of relative wages over 1957-1992. However, as with earlier studies, such methods impose restrictive parametric assumptions on the data. 1 address this problem by using robust, non-parametric techniques to establish the stylized facts on relative wage structure over 1957-1992. I find a significant increase in the relative wages of university versus less educated workers over the 1975-1992 period.

Smce the early 1970's it has been common to attribute relative wage changes to changes in relative supply, although recent work for the U.S. shows that relative supply cannot explain observed widening in relative wages since the mid-seventies. To test whether relative supply changes drove relative wage changes in Chile, I use a disaggregated, non-parametric test. whereby supply-driven changes would imply a negative inner-product between vectors of changes in relative supply and relative wages over sex-schooling-experience cells. I find that relative supply changes cannot explain the observed relative wage changes in Chile since 1975. This result also holds for narrow supply measures and supply measures that include unemployed workers, so that the skill composition of the unemployed cannot explain the rising relative wages. After 1990 there is an apparent drop in relative wages. However, this appears to be partly due to the rising portion of graduates from private universities that provide lower quality educations.

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[1] E.g. Anne 0. Krueger's "The Relationships Between Trade, Employment, and Development, " in: Ranis and Schultz eds., The State of Development Economics: Progress and Perspectives, Cambridge, MA, Basil Blackwell, 1990: 357-385.

Because supply cannot explain rising relative wages, demand changes must have favored more educated workers, either by shifting resources to more skill-intensive sectors, or through within sector skill and occupational upgrading.

The results suggest that the costs of adjustment to trade liberalization may be higher than previously supposed, where the principal potential cost is structural unemployment. Contrary to traditional predictions, these results suggest that trade liberalization can exacerbate the distribution of earnings in the short and medium run. The findings also underline the potential importance of maintaining high levels of investment in higher education to accommodate changes in the structure of demand for labor induced by trade liberalization.

Worsening Relative Wage Dispersion in Chile During Trade Liberalization: Supply or Demand Driven Inequality?

July, 1994

by
Donald J. Robbins
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This work is part of a larger research project with Ricardo Paredes of the University of Chile, without whose substantive data work this paper would not have been possible.

INTRODUCTION

While Chile is widely cited as an example of successful conversion from protectionism to liberalized trade, the impact of trade liberalization on Chile's relative wage structure - the ratio of wages of more educated to the wages of less educated workers - is poorly documented and little understood. This study examines the pattern and causes of relative wage structure of earnings across differing schooling for age groups in Chile over the 1967-1991 period. For a given distribution of schooling, a rise or decline of relative wages will tend to widen or compress, respectively, the distribution of income. The relative wage distribution also affects individual's decisions to invest in education. The ensuing variations in the stock and distribution of educated workers affect both distribution and aggregate economic growth. The market deregulation and downsizing of the state currently being pursued in Latin America and other developing countries are likely to have important short and long-term implications for relative wages. However, these changes are not fully understood. Therefore, developing a better understanding of the impact of structural adjustment and trade liberalization on relative wages is critical to the formulation of policies for poverty alleviation, distribution and - through schooling policies and human capital accumulation - growth. Because the Chilean economy is among the most mature and successful recent examples of trade liberalization among developing countries, it is important to clearly document the path and trends of the country's relative wages and to analyze the impact of trade liberalization upon them. The insights from this study will then provide important information relevant to policy formulation in other Latin American countries undertaking adjustment.

In this study, I examine household survey data for Greater Santiago, Chile from 1957 to 1992 to determine the pattern of relative wage structure and to test for the neutrality of labor demand changes, particularly after 1974 when trade liberalization began. The next section discusses the theory underlying the empirical specification. Section 2 reviews the relevant existing literature for Chile. Section 3 discusses the data, the methodology employed and the results. I find that relative earnings grew rapidly over 1975-1990, and that relative demand structure was not neutral, but favored more educated workers. Section 4 concludes.

SECTION 1. THEORY

Changes The Distribution of Earnings and in the Relative Structure of Wages

To understand how trade liberalization may affect relative wages and the distribution of earnings, it is useful to examine a simple version of the standard earnings function relating wages and schooling. Here wages vary in proportion to human capital (HC) by the rental rate of human capital (Q):

$$(1) \qquad w = \alpha \cdot HC.$$

Human capital is related exponentially to schooling attainment,

$$(2) \qquad HC = e^{\beta \cdot S},$$

where S is the level of schooling attainment. I will call β the gross rate of return to schooling.[2] The variance of log wages is then:

$$(3) \qquad V(\ln(W)) = V(\ln(\alpha)) + \beta^2 V(S) + 2Cov(\ln(\alpha) \cdot \beta S).$$

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[2] β equals the percent change in wages from one additional year of schooling without netting out the direct or indirect costs of schooling. Other productive attributes will also contribute to human capital. Here we focus on schooling for simplicity and because it is the most important measured human capital variable.

Shifts in the demand for labor that are neutral with respect to the type of labor demanded constitute a shifting-out of the aggregate demand for human capital and, given a constant supply of human capital, raises the rental rate of human capital, a. As we can see in (4), this neutral demand shift does increase the variance of wages, however, because it increases all workers' wages in like proportion, relative wages remain constant:

(4) $W \equiv W1/W2 = (\alpha HC_1/\alpha HC_2) = HC_1/HC_2.$

Changes in *relative* wages arise from changes in β, the gross returns to schooling. For constant relative labor supply (i.e. a given distribution of schooling) changes in relative wages require non-neutral shifts in demand that alter the gross returns to schooling. Because the elasticity of substitution across labor types is finite, variations in the composition of aggregate demand across industries and sectors ("between-industry" demand shifts) or demand shifts from factor non-neutral technical change and changes in prices of non-labor inputs ("within-industry" demand shifts) can alter the relative demands for differing educational groups, and hence their relative wages [Freeman(1986)].[3]

This framework allows us to decompose the effects of educational expansion into "composition effects'! and "wage effects" [see Knight-and Sabot(1983); Knight and Sabot(1990); Park, Ross and Sabot(1992); Rakesh and Sabot(1988); Almeida and Barros(199 1)]. For a given gross rate of return to schooling, educational expansion will lower the variance of log(wages) to the extent it lowers the variance of schooling the "composition effect". Changing factor-neutral demand shifts and changing relative supplies induct; countervailing changes in relative

[3] This framework allows us to decompose the effects of educational expansion are often decomposed into "composition" and "compression" effects [see Knight and Sabot(1983); Knight and Sabot(1990); Park, Ross and Sabot(1992); Rakesh and Sabot(1988); Almeida and Barros(1991)]. For a given gross rate of return to schooling, educational expansion will lower the variance of log(wages) to the extent it lowers the variance of schooling. This is sometimes called the "compression effect". For constant educational supply, non-neutral labor demand shifts that increase the gross rate of return to schooling increase the dispersion of wages.

wages - the "wage effects". Kuznets' (1966) inverted-U hypothesis, where the relative wage structure is exogenous, is an example of changing "composition" effects as the distribution of workers across low and high wage jobs changes the course of development [Robinson(1976), Knight and Sabot(1983)].

Recent studies for the U.S. have found that, despite significant educational expansion the dominance of demand shift factors - both between and within - has led to a steady, marked increase in relative wage differentials since 1975 .[3] This has been attributed to changes in demand within-industry which are likely due to skill-biased demand shifts [e.g. Levy and Murnane(1993), Katz and Murphy(1992)]. In short, demand matters and the nature of the demand changes matters. But how may trade liberalization alter relative wages and in what direction?

Trade Liberalization and Relative Wages

It is likely that trade liberalization effects the level and composition of the demand for labor. If trade liberalization leads to higher output growth rates that are neutral with respect to labor inputs then (unlessthe stock of human capital grows at the rate of output) the rental rate of human capital will rise and the dispersion of wages will increase. However, such factor-neutral demand growth will not alter relative wages.

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[3] A series of recent studies on the U.S. emphasizes the importance of changing demand structure on wage structure, and developing improved techniques for studying the patterns and causes of changing relative wages. These studies agree that since the mid-seventies there has been a dramatic widening of earnings differentials favoring the more educated, despite equalizing supply changes. Since supply forces worked in the opposite direction, this deterioration in distribution arose entirely from demand shifts. Those demand shifts involved both between and within changes, involving industry recomposition(between), skill-biased technical change(within), and trade changes(principally, between) [inter alia, Bound and Johnson(1992); Revenga(1992); Freeman and Katz(1991), Borjas, Freeman and Katz(1992), Katz and Murphy(1992); Murphy and Welch(1991); Branson and Love(1988)]. The trade effects studied reveal that the large revaluation of the dollar between 1980 and 1985 lowered import prices of manufactured goods, consequently lowered the share in sales of domestic manufacturing industries. This, in turn, lowering the demand for and wages of less educated production workers [Katz and Murphy(1992); Freeman and Katz(199 1); Borjas, Freeman and Katz(1992)].

Trade liberalization may engender non-neutral factor demand shifts that affect relative wages. By altering relative prices, trade liberalization is likely to alter the composition of output. If different products have differing labor input requirements there may be a net change in the relative demand for different labor types - a non-factor neutral demand shift that I call "between-industry".

Trade liberalization will tend to raise labor demand within all industries, because it tends to reduce the cost of capital relative to labor. However, this alone would constitute a factor-neutral demand shift that would not affect relative wages.

A prominent line of reasoning that extends this standard Heckscher-Ohlin/Stolper-Samuelson ("HOS") argument to heterogeneous labor and the relative wage structure is presented by Krueger(1990). This line of reasoning follows from the Heckscher-Ohlin approach to trade, where free trade can substitute for factor mobility, trade liberalization leads to the expansion of countries' exports of goods using domestically abundant factors. This leads to international factor price convergence. Since developing countries are plentiful in unskilled labor relative to more developed countries, trade will raise the rate of growth of demand for unskilled labor:

> ..... it is a plausible hypothesis that rapid growth in demand for unskilled labor will occur when the labor market is permitted to function fairly freely in the context of a reasonably open trade regime and a realistic exchange rate. [Krueger(1990, p.373)]

Furthermore, liberalizing the trade regime compresses the relative wage structure which tends to improve the distribution of income. Following Stolper-Samuelson, the move from protection to liberalized trade eliminates capital subsidies - raising the cost of capital relative to labor and inducing a shift in the composition of output toward more labor-intensive products. In addition, because capital and skill are complements, this shift away from capital-intensive production will

also lower the relative demand for skill.

> Import-substitution regimes where new investment is directed into new skilled-labor and capital-intensive activities, there is a standard trade-theoretic presumption that the relative prices and costs of these scarce factors of production would be driven up. This would imply, if uniform factor payments prevailed for all activities, that the mix of activities was more capital- and skill-intensive than it would be in the absence of protection, . . [Krueger(1990, p.371)]

In sum, developing countries, like Chile in the period of study, moving from protectionism to trade liberalization should raise the relative demand for skilled, more educated workers versus unskilled, less educated workers and thereby lower relative wages and the dispersion of earnings.[4] I will refer to this hypothesis as the "Extended Heckscher-Ohlin/Stolper-Samuelson hypothesis" or "HOS-X" .

While the extended Heckscher-Ohlin/Stolper-Samuelson hypothesis is plausible, theory is indeterminate on this point. It is well known that HOS does not necessarily generalize beyond the restrictive two-factor, two-product, two-country, constraints and perfect competition assumptions. The HOS-X argument above also assumes that the dominant factor determining the change in trade structure after trade liberalization is plentiful unskilled labor. However, other comparative advantages may dominate[5] [Bruno(1990)] without the expansion of unskilled-labor-intensive exports.[6] Moreover, export expansion could lead to growth in non-tradeables that are

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[4] Furthermore, trade liberalization should lower industry rents arising from high effective rates of protection, that are shared with workers [Schultz(1990), Robbins and Minowa(1991)], further improving the distribution of income [Krueger(1990)].

[5] And, following Bruno(1990), this may be optimal.

[6] Roemer(1988), while mostly discussing the effect of trade liberalization in non-wage income, also makes this point. He argues that the effect of trade liberalization on income distribution depends on the structure of the economy. Exporters' incomes will grow and import substitutors' incomes will decline, so distribution is improved is exporters are low-income (small farmers, smaller scale export industries). Also, changing relative prices of consumption goods can potentially affect differing income groups asymmetrically, with positive or negative effects on income inequality; and, decontrol of import licenses can open up opportunities for lower income groups. Trade liberalization may not improve income distribution in economies that are mineral exporters; capital-intensive, large-scale, export farmings; and with concentrated export industries. [p.20-21)].

skill-intensive (such as banking services - which are important in Chile) or generate derived demands for processing, packaging and marketing that are skill-intensive. The net impact of trade liberalization upon relative demand for different labor types is then indeterminate. Trade liberalization and export expansion could also generate a variety of indirect effects; for example, its contribution to macroeconomic balance could spur growth in non-tradeables that were skill-intensive.

In addition, 'New' trade theory argues that trade liberalization can increase the flow of knowledge across countries [e.g. Coe and Helpman(1994) find that the R&D capital stocks of small countries' trading partners have large effects on total factor productivity]. According to the general theory, the complementarily between the stock of knowledge and education can raise the return to schooling, thereby widening wage differentials across schooling groups [Rivera-Batiz(1993)]. Education may also be complementary to the export process, so that trade liberalization raises the productivity of education, thereby increasing relative wages. Finally, most of these arguments concern the long-run impact of trade liberalization and offer little guidance regarding the short- and medium-term impact on income distribution'.

In-short, while HOS-X -is plausible,., theory does not provide firm guidance. regarding on the impact of trade liberalization on income distribution. Tt is foremost an empirical question. In the next section, I provide some historical context and review previous studies on relative earnings in Chile after trade liberalization.

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[7] Grossman(1982,1984)'s important studies of trade liberalization for the U.S. assume that the impact of (net) import price changes (through tariff changes, devaluation, or exogenous productivity changes) is complete after eighteen months. However, there is no a priori reason that domestic response to relative price changes will be so rapid, nor are there good studies of this response time.

SECTION 2. STUDIES OF TRADE LIBERALIZATION AND RELATIVE EARNINGS IN CHILE

The Chilean economy grew rapidly from 1976 through 1982, before floundering as the second round of petroleum price rises and the international debt crisis weakened world trade. Structural weaknesses in the Chilean economy- deriving largely from unfettered financial sector deregulation that spawned a web of interlocking directorships and the dramatic concentration of ownership backed by unsound finance and excessive international borrowing - were revealed. In this context, the crisis in international trade led to the insolvency of Chile's banking sector and contributed to a severe depression. After 1982, many post-1973 privatizations were reversed and most of the banking sector "intervened". Open unemployment in the early eighties rose to nearly thirty percent. Sound export and employment growth can only be seen as being firmly established subsequent to 1985. Thus, study of the effects of trade liberalization upon (long-run) relative wages across educational groups must both examine data subsequent to 1985 and use micro wage data.

While there are a number of studies of the employment effects of trade liberalization, most only use data through the early 1980s and none examine the relative returns to education across the period from IS1 to successful export-led growth [*inter alia*, Corbo and Meller(1981,1982); Cauas and de la Cuadra(1981); Cortes-Douglas and Sjaastad(1981); Cortes-Douglas, Butelman and Videla(1981); Riveros(1985); Riveros(1989)]. The macro studies of employment and average wage measures do not yield information on relative earnings.

Relative Earnings Across Education Groups

The principal study to use post-1985 Chilean worker level wage data to examine returns to schooling across different groups is Riveros(1989). Riveros reports that the net (private and social) rates of return to schooling declined in Chile over the 1960 to 1985 period. In addition, Riveros(1989) documents significant educational expansion during this period which effectively increased the relative supply of more educated labor. Since, with constant relative demand, an increase in the relative supply of a factor should reduce its relative price, Riveros attributes the drop in net returns to educational expansion.

However, while net returns affect the demand for education and hence the long-term supply of educated workers, educational expansion - or increases in the relative supply of educated workers - should affect gross returns to education.[8] Examination of the estimated earnings functions reported in Riveros (1989, Table 2) shows that gross rates of return to schooling increase steadily and significantly over the period - notably after 1973 and the initiation of trade liberalization. Riveros (1989: Table 2,p. 115)] reports log earnings functions estimated for cross sections from 1967 through 1985 and shows schooling coefficients that increase from . 11 to .15 over this period - a thirty-six percent increase in gross returns.-

This increase in gross returns **to schooling** runs **counter** to the relative supply shifts that Riveros(1990) documents. The expected "compression" effects from educational expansion do not occur and changes in the wage structure over this period were unequalizing. It also implies that relative demand factors shifted strongly in favor of more educated workers during the shift

[8] ..[with] educational expansion there is a tendency for the educational structure of wages to be compressed. Because returns to a factor decrease as its relative supply increases, **we** expect **the coefficient on education in an earnings function** to decline as education expands relative to other factors." [Park, Ross, Sabot(1992) (bold type is added)]

from IS1 protectionism to liberalized trade.'

Conclusions and Questions

These observations of increasing relative wage dispersion also appear to contradict the predictions concerning the effects of trade liberalization discussed above. The main prediction of HOS-X was that trade liberalization would improve the relative earnings of the less skilled and less educated. Given Chile's strong educational expansion during this period [see the figure for educational expansion in the appendix] and the expected tendency towards wage compression, this observed worsening of the wage distribution is especially striking.

If these conclusions are robust, the distributional predictions of trade liberalization must be re-considered. This does not deny the great success of the Chilean economy in eventually creating employment. Indeed, by 1992 the very high levels of aggregate unemployment since 1975 had declined to about four percent and the incidence of poverty has significantly declined compared to its post-1975 levels.

An important caveat concerning the robustness and completeness of the available information regarding relative wages is warranted. The functional form estimated -- log earnings linear in schooling -- forces the rate of return to schooling to he the constant across workers of differing schooling levels in each year for which cross-sectional earnings functions are estimated. This is an arbitrary assumption[10] that hides potential changes in relative returns to schooling

[9] This also implies that changes in the cost structure of education are behind his result of falling net rates of return; this requires a decrease in the overall level of educational subsidies, and panicularly for university students, and is consistent with his reporting on cost subsidies going against university students.

[10] If human capital were perfectly homogeneous, and the elasticity of substitution across labor types were infinite, linearity would be satisfied. But that assumption is not supported by the empirical literature [Freeman(1986)].

across different demographic groups of workers (with differing schooling levels). Recent work for the U.S., for example, uses far less restrictive techniques to characterize the basic changes in relative wages. [11]

In conclusion, contrary to Heckscher-Ohlin inspired predictions, and despite relative supply changes operating in an equalizing direction, it appears that the relative wage distribution worsened during Chile's move from IS1 protectionism to liberalized trade. This potentially important conclusion is tempered, however, by the use of a highly restrictive functional form and data that only extends through 1985 This approach perhaps understates the leveling effects of continued trade expansion. Moreover, the available work does not test the determinants of changes in relative wage structure in an explicit supply-demand framework so the causal story behind the changes remains unclear.

In the next section I address these weaknesses by employing flexible functional forms, extending the data through 1992 and testing for the neutrality of demand in a disaggregated framework. I will first establish the "stylized facts" regarding changes in the relative wage structure over the 1967-1991 period. Then I will examine the causes of these changes in a series of hierarchical tests. Here I will test if - as argued above - relative supply shifts are unable to explain relative wage changes.

[11] Recent work shows that this functional form is often incorrect [see, for example, Robbins and Minowa(1992), Park-Ross-Sabot(1992) and Barros-Ramos(1992) for Brazil and the U.S. studies cited above].

SECTION 3. DATA, METHODOLOGY AND EMPIRICAL RESULTS

It is useful, initially, to think of a labor market with two types of workers where type one is skilled with high levels of education and type two is unskilled with low levels of education. Letting subscripts 1 and 2 refer to more-skilled versus less-skilled workers, respectively, and letting lower case letters refer to relative quantities and relative prices, we allow the relative wages of more-skilled versus less-skilled labor to be represented as **the** ratio $w \equiv W1/W2$, and may express relative wages in terms of relative supplies and demands.

Relative wages reflect both relative supply and relative demand. The marginal effect of increases in relative demand on relative wages is positive and the marginal effect of an increase of relative supply on relative wages is negative; $d \equiv D_1/D_2$ or relative demand and $s \equiv S_1/S_2$ or relative supply and hats, "$\hat{x}$", represent rate changes. This allows us to express changes in relative wages in terms of changes in relative demand and supply:

(5) $\hat{w} = \alpha \cdot \hat{d} + \beta \hat{s}$; $\alpha > 0, \beta < 0,$

where α and β are elasticities of the dependent variables with respect to the corresponding right-hand variables, with α positive and β negative. When I impose the CES production function in two labor inputs (5) becomes

(5a) $\hat{w} = (1/a) [a - \hat{s}]$,

where σ is the elasticity of substitution between the two labor types [see Freeman(1975,1979), Katz-Murphy(1992), hereafter KM92].

The extended HOS hypothesis states that more liberal trade (or "TL↑") lowers relative demand (d) or $\partial d/\partial TL < 0$. As a consequence relative wages fall, as discussed above, for a given relative supply of labor:

(6) $dw/dTL = (\partial w/\partial d) . (\partial d/\partial TL) < 0.$

Before turning to the causes behind changes in relative wages, however, I try to examine what happened to the time-series of relative wages, W(t). I do this using three different techniques. First, I calculate the time-series of relative wages using regression techniques. I then calculate the time-series of relative wages using a more robust, non-parametric, disaggregated approach.

The principal data used in this study are the University of Chile's closely comparable household surveys for Greater Santiago from 1957 through 1992. The average sample size of active labor force per year is roughly four thousand. This data contains both worker characteristics, including age, schooling, sex, sectoral affiliation, labor force status (employed, self-employed, unemployed, out of labor force), occupation and economic activity.

Regression Results for Multiple Cross Sections

The first, and most accessible approach estimates earnings functions for each cross-section. Instead of a linear schooling term, I substitute three schooling attainment dummy variables. This formulation has the important advantage over the linear-in-schooling specification of allowing the structure of earnings across schooling levels to freely vary across four schooling attainment groups in accordance with fluctuations in supply and demand changes specific to each group [for example Morley's (1992) recent work on income distribution in selected Latin America counties uses this methodology]. Thus, for each year 't' I estimate a function of the form:

(7) $\ln(w_i) = \alpha_0 + X_i'\delta + \Sigma_{j=1-3} DSCHOOL_{i,j} + \varepsilon_i,$

where w_i is the i-th worker's wage, X_i is a vector of worker characteristics, including experience and sex, and the two $DSCHOOL_{i,j}$ variables are dummy variables reflecting the i-th worker's education attainment (one group's attainment being reflected in the intercept term).

Figure one plots this estimated gross returns to schooling from the specification of the earnings function that is linear on schooling over the 1976 through 1991 period. It also includes the estimated trend line of relative wages. I draw two conclusions. First, average gross returns increase dramatically over this period, rising seventy-five percent from .08 in 1976 to .14 in 1991. Second, gross returns to schooling are sharply procyclical, dropping between 1980 and 1983 as Chile moved into a deep depression. The path subsequent to 1982 shows a relatively constant, rapid ascent of gross returns in tandem with the economic expansion while aggregate unemployment declined.

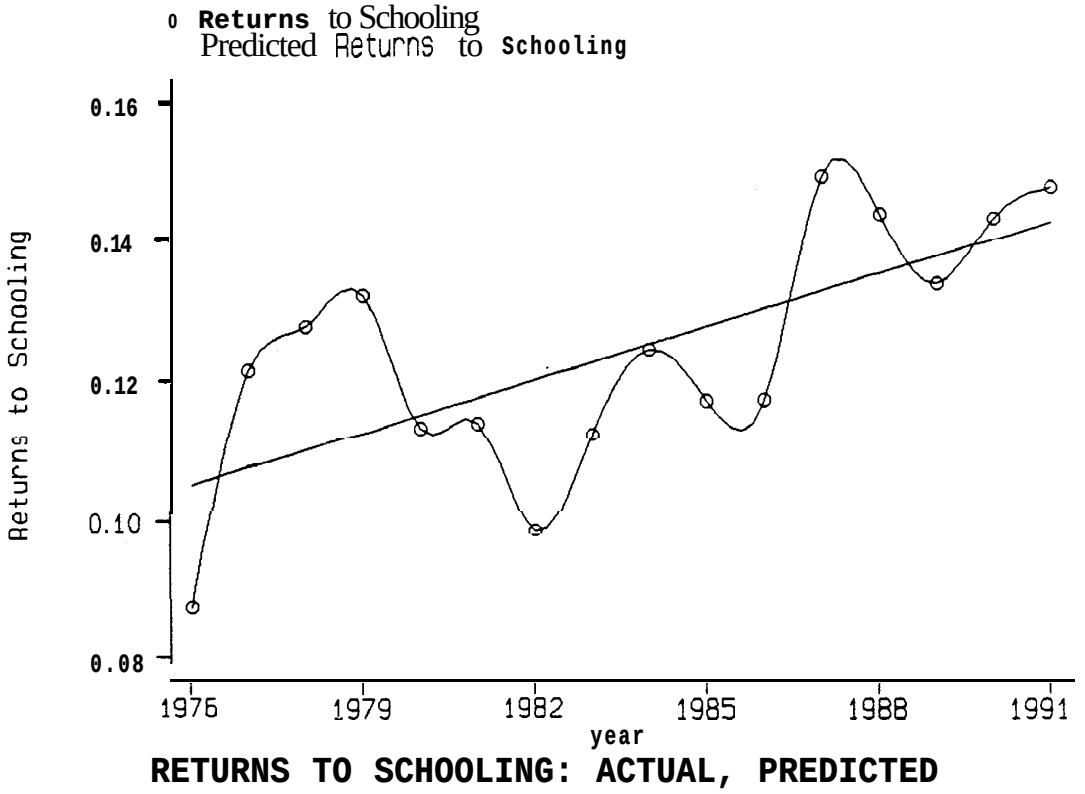

o Returns to Schooling
Predicted Returns to Schooling
0.16
0.14
0.12
0.10
0.08
Returns to Schooling
1976
1979
1982
1985
1988
1991
year
RETURNS TO SCHOOLING: ACTUAL, PREDICTED

Figure 1

These results are borne out in the alternative dummy-variable specification of the earnings function that permits a more flexible functional form of the wage-schooling curve. Figurc 2 plots the estimated wages of university graduates versus primary school graduates, the fitted trend line of relative wages and the aggregate unemployment rate over 1976-1991. Here too, 1 find a marked trend towards rising relative wages over the 1975-199 1 period. I also find that relative wages were procyclical, moving opposite to plotted aggregate unemployment. Since rising unemployment that exerted downward pressure on unskilled workers' wages would require countercyclic wages, this suggests that increases in relative wages were demand driven. [12] I also note that, over this period, the wages of secondary school graduates remained in nearly constant proportion to the wages of primary school graduates through 1990, then increased relative to primary workers' wages in 1991 (see appendix).

[12] We return to this point in more detail in our work on the structure of demand changes.

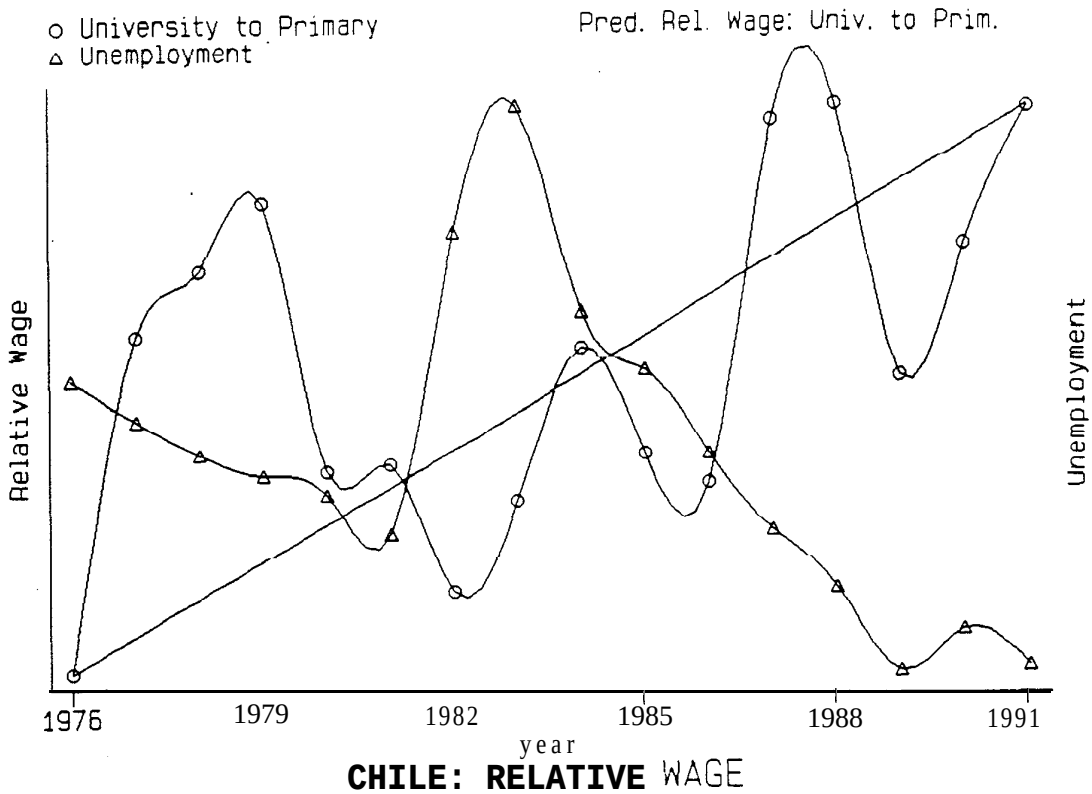

University to Primary
Unemployment
Pred. Rel. Wage: Univ. to Prim.
Relative Wage
Unemployment
1976
1979
1982
1985
1988
1991
year
CHILE: RELATIVE WAGE

Figure 2

Contrary to the HOS-X predictions these preliminary findings suggest that the post-trade-liberalization-period - characterized by the rapid growth of exports and a rising share agricultural exports - is unexpectedly associated with rapid growth in the dispersion of relative wages. This dispersion nearly doubles over the period. The result is both puzzling and alarming in its implications for income distribution for two reasons: first, while the pattern of export expansion does largely follow HOS-X, relative wages still rise. Second, the explosive growth in agricultural employment in 1985-6 should have lowered relative wage distribution, but the opposite is observed. In 1985 agricultural employment rose 13.5 percent and in 1986 agricultural employment rose an astonishing 31 percent [National Statistical Institute]. Since agricultural employment is overwhelmingly unskilled, how is it that such a precipitous increase was accompanied by a rapid increase in the relative wages of university graduates?

Moreover, the growth in wage dispersion seems to be between university graduates and all other workers, with relative wage dispersion between primary and secondary graduates nearly constant through 1990. Overall, it appears that the nature of growth in Chile favored university graduates, with this non-neutral factor demand pattern disappearing during the 1982-4 depression and then resuming in the subsequent recovery.

Disaggregated, Non-parametric Methods Applied to the 1960-1992 Period

In this section I seek corroboration of the above results of growing wage dispersion across schooling groups using more robust statistical measures. I then test whether supply changes alone could explain the observed relative wage changes; in essence, a test of the neutrality of labor demand across differing labor types.

If there are more than two labor types, then one must consider a more disaggregated approach to studying the relative wage structure. Regression techniques may require excessive aggregation across potentially different labor types and, in so doing, impose excessive structure on the observed wages. Here I adopt an alternative, complementary, non-parametric approach that avoids restrictive functional forms and excessive aggregation [see Murphy and Welch(1991) and Katz and Murphy(1992)]. Earlier, I aggregated workers for each year into two groups and **calculated the** mean wages for each group controlling for their productive characteristics, W = (W1,W2). Now, I use a different technique to construct a vector $\underline{W}' = (W_1, W_2, \ldots, W_k)$, where W_i is the mean wage for a *fixed demographic group* normalized by a constant-employment-share weighted mean of total wages for thc ycar.

For each year, I organize the individual worker data into ninety-six cells corresponding to a cross-classification of workers by sex, schooling and experience (two groups for sex; six groups for schooling, and eight groups for experience). For the same cells I then construct wage and count matrices. The (relative) count matrix is the number of hours worked per cell, divided by total hours worked per year, across the years 1960-1992. The average relative count vector, $N_{1960\text{-}92}$, i.e. the average distribution of relative hours across all years, is used for a fixed-weight aggregation scheme that holds the composition of workers constant across years, whenever aggregating across cells. The wage matrix consists of the relative wages for each cell, where yearly mean wages are divided by the product of the fixed-weight share vector, $N_{1960\text{-}1992}$ and the yearly wage vector (across cells) or $N_{1960\text{-}92}'W(t)$, for each year t. This generates a series of wage vectors for the same demographic distribution that are comparable across time, analogous to the vector for two groups of workers $\underline{W}(t)$ = (W1,W2)(t) discussed earlier, but now

with a 96 elements instead of two.

Using this general structure, Table 1 presents real wage changes for employed workers. I find that real wages [here using mean wages for cells normalized by the CPI (Cortazar-Marshal series)] for all workers increased roughly seventy-two percent in the sixties, dropped eighty percent from 1970 to 1975, increased about one hundred percent from 1975 to 1980, dropped again between 1980 and 1985 and increased forty-two percent from 1985 to 1990 and seven percent from 1990 to 1992. Overall, the post-coup and post-reform period (1973 and 1975 onwards, respectively) are characterized by increasing real wages, but from a very low post-coup floor. Real wages had dropped rapidly prior to the coup as inflation accelerated, and continued to drop as drastic stabilization and anti-union measures were subsequently implemented. Chile also suffered a massive depression between 1982 and 1984, during which time wages also dropped again. Overall, real wages did generally rise after 1975, but these calculations using a fixed demographic weighting suggest that real wages had not yet returned to 1970 levels by 1992. [13] The second line of Table 1 shows a similar pattern for men and women, though men's wages increase more in the 1975-80 period, and women's wages increasing somewhat more rapidly in the 1985-1992 period, with an acceleration of this trend in women's relative wages between 1990-92.

[13] Given enormous inflation over this period, real wage comparisons are. extremely sensitive to the deflator used, and these results may overstate real wages in earlier years.

Real Ueekly Uage Changes for Full-Tim Uorkers in Chile, 1960-92. Table 1

Percent Change in Real Ueekly Uage
(multiplied by 100)

Group	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-92
All	28.3	33.9	-80.1	103.7	-36.5	42.3	6.8
Men	31.9	33.9	-80.9	115.0	-36.9	39.9	4.2
Women	23.4	33.9	-78.8	88.5	-36.0	45.7	10.5
Education Primary							
Incomplete	14.0	39.2	-72.4	63.8	-35.2	31.6	21.4
Complete	14.2	34.8	-77.0	55.9	-35.6	35.9	29.4
Education Secondary							
Incomplete	18.0	9.9			-46.0	27.9	18.1
Complete	13.0	32.3	-75.6 -79.9	82.1 98.6	-37.9	9.9	9.1
University	45.4	37.4	-83.2	142.1	-34.7	63.1	-3.5
Special	34.3	41.4	-78.6	81.5	-35.6	33.6	25.8
Experience (men):							
Experience <= 5	35.1	29.7	-40.0	-34.4	-11.5	20.9	2.2
Experience >= 6	34.7	34.2	-81.1	110.9	-37.0	39.1	7.5
Education and Experience (men):							
Basic							
Incomplete							
Experience >= 6	12.9	38.7	-72.7	57.9	-35.5	32.1	17.7
Complete							
Experience <= 5	110.7	-5.1	-78.9	95.5	-39.4	23.8	59.2
Experience >= 6	7.1	43.3	-78.9	68.1	-36.2	35.4	23.7
Secondary							
Incomplete							
Experience <= 5	46.4	-13.1	213.3	-79.8	-44.1	49.2	14.7
Experience >= 6	7.3	20.7	-74.9	73.5	-43.5	18.9	20.0
Complete							
Experiwe <= 5	63.3	5.0	-76.1	62.2	-47.9	58.2	20.9
Experience >= 6	22.1	38.2	-81.6	117.1	-35.7	-0.5	5.4
University							
Experience <= 5	-17.5	75.5	-78.3	72.6	-18.7	54.0	-14.5
Experience >= 6	57.1	27.3	-84.0	168.1	-39.2	68.3	-3.7
Special							
Experience <= 5	10.5	27.8	-75.1	143.7	-51.4	21.5	51.4
Experience >= 6	50.2	48.8	-81.2	77.4	-29.9	28.6	25.3
Experience (women):							
Experience <= 5	-10.8	19.8	-77.4	111.3	-42.4	67.5	-1.3
Experience >= 6	35.4	31.4	-77.7	75.1	-34.6	41.0	19.4
Education and Experience (women):							
Basic							
Incomplete							
Experience >= 6	22.7	41.5	-70.3	98.5	-34.6	25.8	40.7
Complete							
Experience <= 5	-30.1	-15.2	-43.6	73.5	-59.8	81.1	84.3
Experience >= 6	59.5	10.0	-68.2	9.5	-29.0	37.5	47.9
Secondary							
Incomplete							
Experience <= 5	47.1	-48.8	-57.4	23.0	-35.8	63.2	16.3
Experience >= 6	52.6	-11.7	-78.9	120.2	-54.7	59.2	13.1
Complete							
Experience <= 5	-64.7	29.2	-77.2	81.2	-46.2	17.5	27.1
Experience >= 6	28.5	22.9	-76.4	67.8	-41.1	33.8	13.2
University							
Experience <= 5	61.4	54.4	-83.6	154.8	-36.1	101.0	-24.9
Experience >= 6	47.8	58.6	-82.7	98.1	-23.8	38.9	13.2
Special							
Experience <= 5	47.6	16.6	-76.7	152.9	-46.9	30.9	15.2
Experience >= 6	10.1	37.1	-73.7	55.0	-36.0	49.7	22.8

Turning to the next panel of real wage changes by schooling group, I find that wage increases of university graduates surpassed those of other school groups over the 1975-1990 period. Figure 3, which graphs relative wages of workers by school groups from 1975 through 1990, shows a similar pattern (here I use the fixed-weight aggregation method described above). The top three lines of this figure plot the wage ratios of university graduates to primary, secondary-incomplete and secondary graduates (in descending vertical order). I find, for all three ratios, that the relative wages of university graduates rise rapidly.

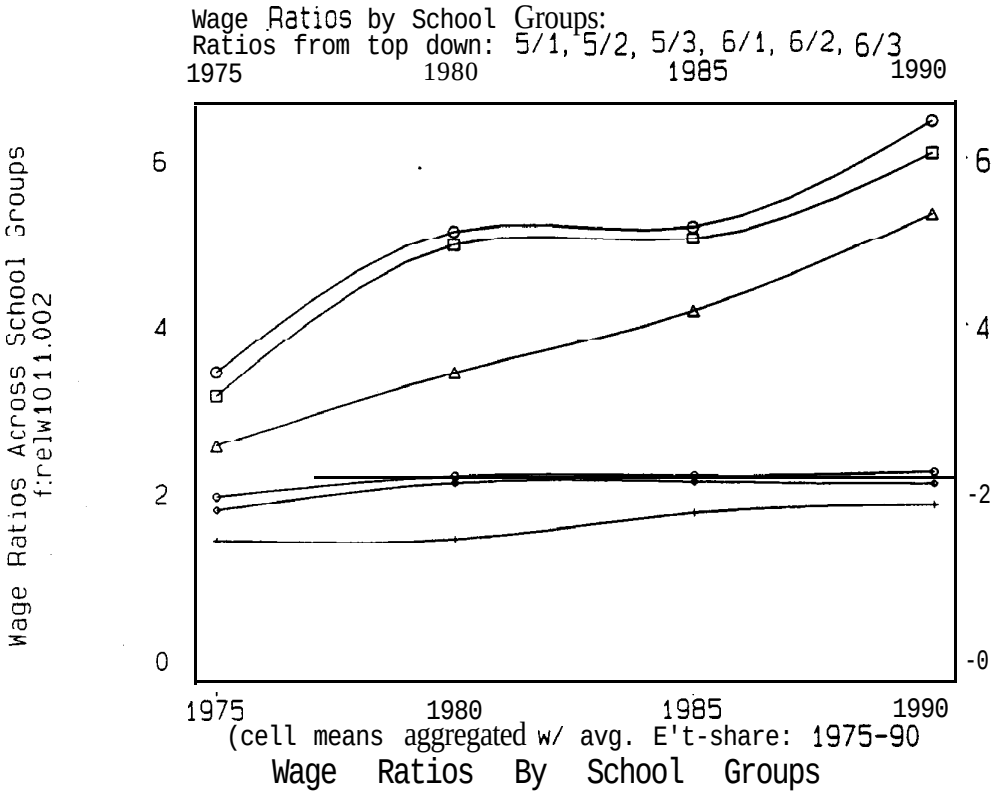

Wage Ratios by School Groups:
Ratios from top down: 5/1, 5/2, 5/3, 6/1, 6/2, 6/3
1975
1980
1985
1990
Wage Ratios Across School Groups
f:relw1011.002
6
4
2
0
.6
.4
-2
-0
1975
1980
1985
1990
(cell means aggregated w/ avg. E't-share: 1975-90
Wage Ratios By School Groups

Figure 3

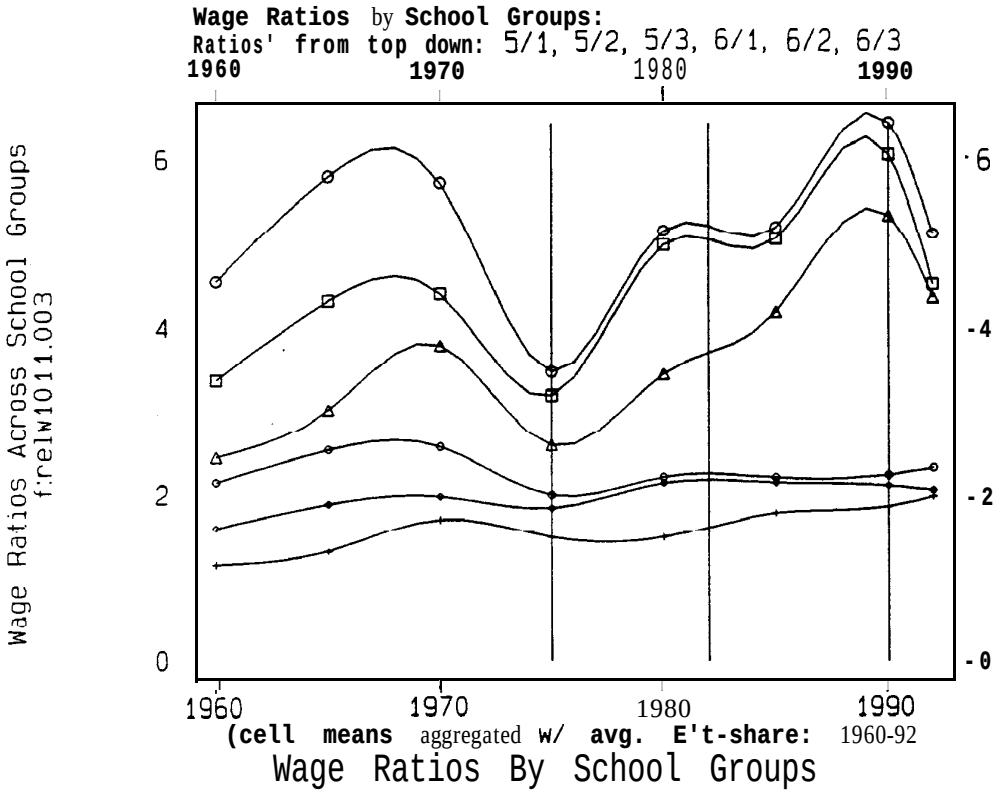

Wage Ratios by School Groups:
Ratios' from top down: 5/1, 5/2, 5/3, 6/1, 6/2, 6/3
1960
1970
1980
1990
Wage Ratios Across School Groups
f:relw1011.003
6
4
2
0
·6
-4
-2
-0
1960
1970
1980
1990
(cell means aggregated w/ avg. E't-share: 1960-92
Wage Ratios By School Groups

Figure 4

There is clear evidence from two series of regression estimates and from disaggregated, non-parametric estimates showing that the relative wage structure changed over the 1975-1990 period in favor of university graduates. However, one would like to know whether this trend will continue, and how it compares to earlier periods.

In Table 1 under Education-University, in the right-most column for 1990-1992, I find a decline of 3.5 percent of real wages for workers with university education, while wages of other school groups rise between nine and twenty-five percent. Finally, Figure 4, which extends the plots in Figure 3 backwards to 1960 and forwards through 1992, shows a drop in the university wage premium over 1990-1992. Caution must be exercised in the post- 1990 estimates, however. It is possible that these estimates are misleading, because during this period there was an outpouring of graduates from newly formed private universities that are widely regarded in Chile to be of lower average quality than the traditional universities. I find that relative wages declined more rapidly for recent graduates which is consistent with this hypothesis, though not conclusive.

While it appears that relative supplies of university graduates increased in the post-1975 period, which should have tended to equalize relative wages, more formal testing is needed. In the next section I test whether relative supplies alone could have explained the increasing trend in relative wages.

Determining the Causes of Changing Relative Wage Structure: Testing the Factor-Neutral of Demand Shifts

As discussed above, relative wages will be affected by changes in both relative demand and relative supply. In the seventies Freeman(1975,1979) pioneered the study of relative wage structure using the framework presented above;

(5a) $\hat{w} = (1/\sigma)\ [\ \hat{d} - \hat{s}\ ].$

Freeman used regression techniques to construct the relative wage index and employment data to construct relative supply[14]. He estimated demand shifts assuming that labor inputs were used in fixed proportions, so that a change in the distribution of employment across industries would potentially imply changes in the overall demand for different labor types.

This approach is limited in two respects. First, it makes the highly restrictive assumption that there are only two labor types and imposes strong parametric assumptions linking observed worker characteristics and the two labor types. Second, demand shifts are not directly observed.

I would like to develop a disaggregated tests of the effects of relative supply and demand shifts. However, it is not currently possible to simultaneously control for supply and demand along the lines done by Freeman, described above. I can use the above framework to develop similar tests. In particular is useful to focus on supply. In the 1960's and 1970's, it became increasingly common to ascribe relative wage changes to changing relative supplies (see Levy and Murnane(1992)). Rewriting equation (5a) in terms of relative levels - w, d, s - I get:

(5c) $w = e^{(1/\sigma)} d/s,$

so that the total derivative of w with respect to s, dw/ds, is negative if "dd" (the differential of

[14] This assumes that the macro labor market clears and that supply equals demand. Below I incorporate alternative, broader measures of supply that include non-employed workers.

relative demand shifts) is zero, implying that relative demand changes are neutral. If dw/ds is not negative for given data, I then conclude that demand was not neutral. This test can be generalized to greater than two labor inputs by using the vector of relative wages and supplies and taking the inner product: ds'dw across suitable intervals. If this inner-product is positive, then relative demand shifts were non-neutral for the period.

More formally, following KM92, if I have an aggregate production function of J labor input types, then I can write the factor demands as:

(8) $X_t = G(W_t, D_t)$

where X_t, W_t, and D_t are the vectors of labor inputs, wages and demand shift variables, respectively, in year t. Taking the total differential of X, I get:

(9) $dX_t = G_w dW + G_D dD.,$

Premultiplying by dW_t and rearrangement gives us:

(10) $dW_t'(dX_t - G_D dD) = dW_t G_w dW \leq 0$

where the right-hand side is a quadratic form, and less than or equal to zero, because G_w is negative semidefinate when the aggregate production function is concave. From this I can generate the analogue to the expression. for the two-factor case above, $dW/dS < 0$, by considering (10) when demand is neutral so that $dD = 0$. The expression simplifies to:

(11) $dW_t'dX_t \leq 0.$

I will refer to this as the Inner-Product test. If the inner-product is positive then supply alone cannot explain relative wage changes, and relative demand shifts must have been non-neutral[15]. Levy and Murnane(1992) call this the Econ. 1 test, since it says that an increase in relative factor

[15] The inner product test if value for inputs measured as changes in levels or relative inputs (see KM92, footnote 48).

supplies should lower relative factor prices if demand is constant.

Following KM92, I implement this Inner-Product test using the disaggregated relative wages, and examine their inner product, dw'ds. To do this I generate 96x1 vectors dW and dS for various intervals. In the U.S. literature supply is measured using a broad definition of employment including self-employed workers. This makes sense when the economy is in full-employment so that supply equals demand. In Chile, however, there was high unemployment over much of the period studied. This was likely due to a state of disequilibrium. Consequently, I also measured supply using relative counts for the vector of 96 cells of the entire potential labor force including employed, unemployed and out-of-labor-force persons (i.e. I counted the number of all persons working or not in each of the 96 demographic cells, then divided this by the total number of persons). I performed the inner product test using both the narrow and this expanded supply measure.

The results of this test are presented in Table 2 for six intervals in the 1960-1992 period. In four of these intervals I find the inner products to be positive, thus showing that supply alone can not explain the pattern of changes in relative wages and implying that relative demand changes were non-neutral in these periods. Only in the major depressions of 1970-75 and 1980-85 periods are the inner products negative and consistent with neutral relative demand. This pattern continues through 1990-1992 for which the inner product is quite large. It is important to note that the results are the same whether I use the narrow supply measure or the broad supply measure that includes unemployed and out-of-labor-hrce workers (that measure is actually higher in for all intervals). This shows that the composition of unemployment and discouraged workers was not driving the relative wage changes. In sum, over the 1975- 1992 period demand growth

was non-neutral and favored more skilled workers.

Table 2. Inner Product of Changes in Relative Wages with Changes in Relative Quantities Supplied (figures in parentheses use relative counts for entire potential labor force)

YEAR	1960	1970	1975	1980	1985	1990
1970	.037 (.093)					
1975		-.246 (-. 159)				
1980			.171 (.252)			
1985				-.187 (-. 161)		
1990					.013 (.058)	
1992						.192 (.242)

note: For non-working individuals, hours are unavailable; figures in parentheses use relative counts (numbers of persons per cells divided by total number of persons) for entire labor force.

While the inner products reported above sum the products of wage and quantity changes over the ninety-six demographic cells, the Econ. 1 test should generally hold for individual cells as well. To examine this I turn to Figure 5 below, that plots the wage and quantity changes for each demographic cell. If the Econ. 1 test passes for all demographic groups I would expect observations to lie in the second and fourth quadrant, along a negatively sloped line, while observations in the first and third quadrants would indicate that relative demand changes are non-neutral.

Changes in Relative Wages and Relative Supplies for Sex-Education-Experience Cells: Inner Product Test

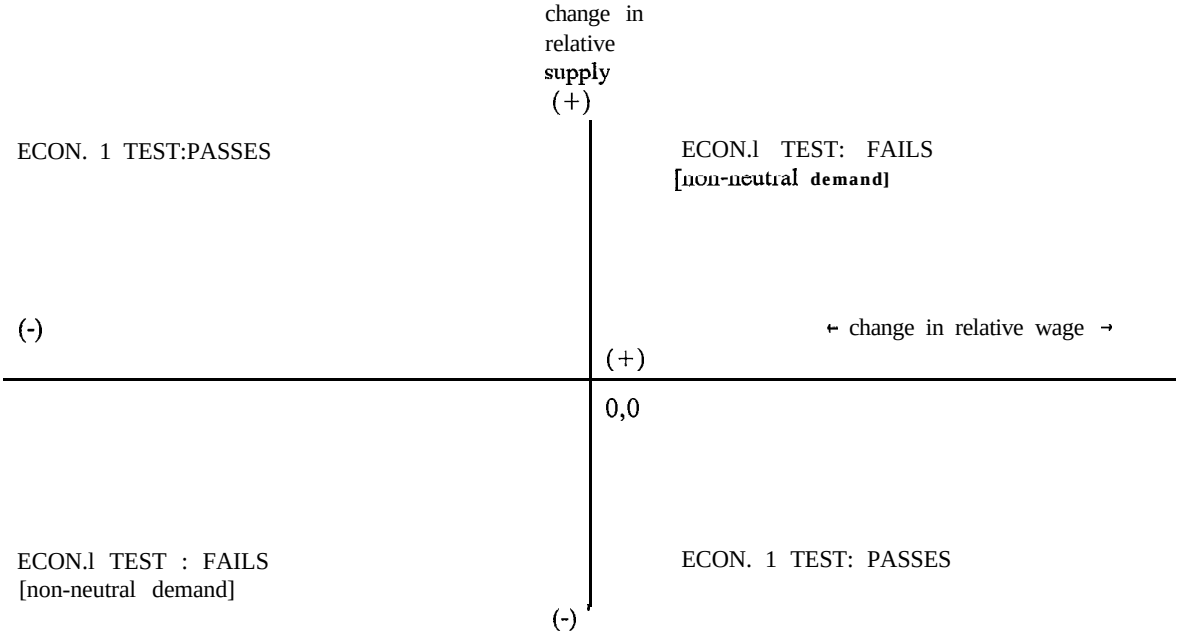
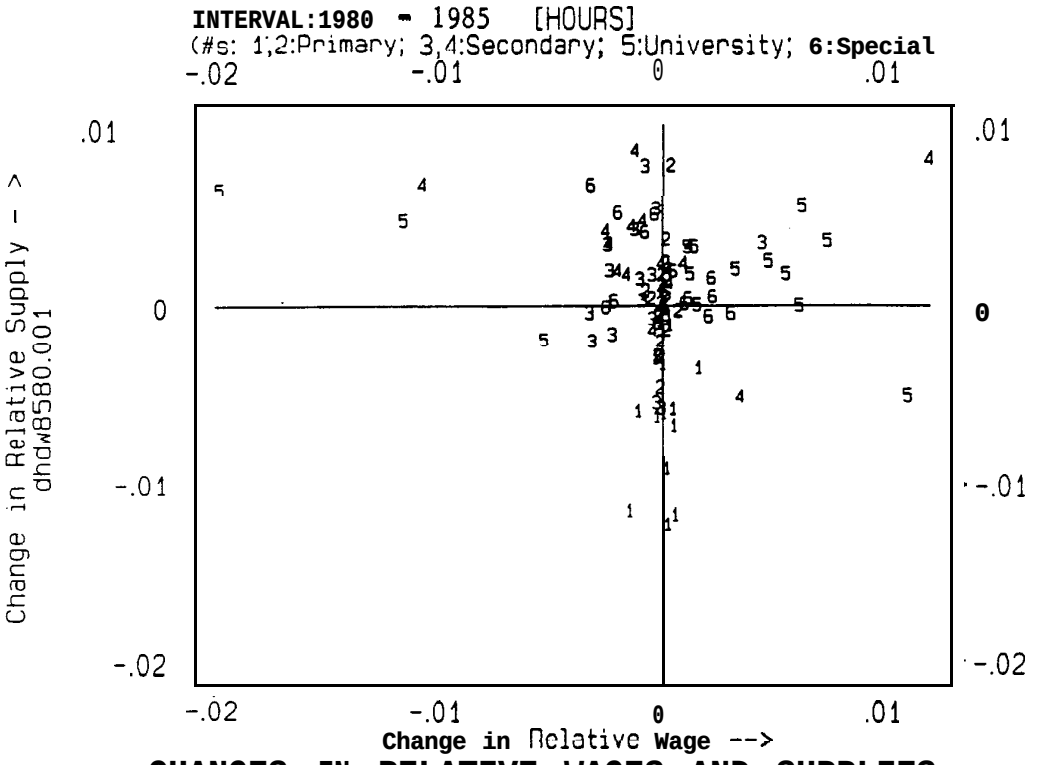


Figure 5

Across the intervals for which I calculated the Inner-Product test of 96 cells, roughly between thirty and fifty cells have positive products of wage and quantity changes, emphasizing the non-factor neutrality of demand shifts. In Figure 6 I plot the wage and price changes for the demographic cells that are used to calculate the inner products reported in Table 3 (the figures

for hours for the narrow supply definition and counts for the broad supply definition over six intervals are found in the appendix). Figure 6 and the most plots in the appendix show that many observations lie in quadrants one and three, implying that demand was non-neutral. For example for 1960-1970, using the narrow measure of supply, fifty-seven observations (or over sixty-percent of the observations) lie in the first and third quadrants. The points plotted as numbers one through six correspond to the schooling groups of the cells (1: primary incomplete; 2: primary complete; 3: secondary incomplete; 4: secondary complete; 5: university; 6: special (vocational high school)). I find, for example, in Figure 6 that most of the observations in the first quadrant are fives and sixes: university and Special school graduates (Special education is non-university post-secondary education mostly technical and professional schools). This pattern is typical for most intervals and shows that relative wages increase for university and special graduates while their relative supplies also increased, so that relative demand must have been biased in their favor.



CHANGES IN RELATIVE WAGES AND SUPPLIES

Figure 6

SECTION 4. CONCLUSION

The extended Heckscher-Ohlin/Stolper-Samuelson hypothesis argues that in developing countries liberalizing trade will lower relative wages, thereby improving the distribution of earnings. However, for Chile I found that trade liberalization was accompanied by rapidly rising relative wages, and that this was not due to the changing relative supply of workers or pressure of unemployment on wages, implying that demand shifts were non-neutral and favored university educated workers.[16] While further work is required to more fully isolate the effects of trade liberalization, what do these findings appear to suggest? In what way is HOS-X incorrect or incomplete?

After 1375, in Chile the share of capita-intensive mineral exports fell and the share of agricultural, forestry, and fishing exports rose. The latter are generally intensive in unskilled labor. Agricultural employment expanded significantly after 1985. Increases in manufacturing exports were principally in products such as shoes and leather goods - again, usually intensive in unskilled labor [Meller(1992), IDB Trade Statistics]. This pattern of trade after trade liberalization- reflecting the abundance of both unskilled labor and natural resources - appears consistent with HOS.

Thus, the premise of the HOS-X hypothesis appears warranted. It is, indeed, surprising that this pattern of export growth has not biased factor demand towards unskilled labor, thereby lowering relative wages. Why the opposite overall pattern of demand, biased in favor of skilled workers, dominated is unclear. To the extent that trade liberalization was responsible for skill-biased demand, it would appear to have done in large measure through largely indirectly means.

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[16] Robbins(1994-B) extends this analysis, finding that alternative domestic policies cannot explain the rising relative wages after 1975.

Higher education may be complementary to the export process, so that while the production of export goods is not skill-intensive, the marketing and distribution of export goods is skill-intensive. A distinct, though compatible, view is found in some of the 'New' trade theory which suggests trade increases inter-country knowledge transfers and subsequently raises the productivity of education, thereby raising the returns to schooling and relative wages. Further research is required to test these hypotheses. One important step towards understanding the causes of the skill-biased demand pattern found is whether this arose from shifts in output across sectors of varying skill-intensiveness or whether this arose principally from changes in labor usage within activities associated with technical change. Rapid within sector changes towards more skilled workers tend to support the 'New' trade theories wherein trade liberalization engenders the modernization of equipment and organization that raise the value of education.

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all others available upon request

APPENDIX:

TABLES AND FIGURES

Table la

Relative Supply Share Changes, 1960-92
(narrow supply measure)

Group	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-92
Gender:							
		8.9	4.2	17.3	-5.7	8-0	-4.5
Women	10.8	14.0	27.2	47.6	7.5	3.9	-9.6
Education Primary							
Incomplete	-28.8	11.1	-20.7	-34.9	-43.9	-40.4	118.9
Complete	-33.3	12.5	11.1	-10.0	11.1	-30.0	-28.6
Education Secondary							
Incomplete	-15.5	-15.2	-14.9	-22.8	-12.5	-28.6	-12.7
Complete	40.5	-8.1	20.9	23.2	2.2	-1.7	-6.1
University	-10.7	30.8	22.3	49.6	0.4	13.3	-14.3
Special	29.2	-8.4	-6.3	-13.5	21.7	15.7	46.9
Experience (men):							
Experience <= 5	21.1	27.3	1.4	43.1	-33.5	42.8	-8.1
Experience >= 6	-35.8	4.5	16.2	24.5	6.3	6.7	-8.9
Education end Experience (men):							
Basic							
Incomplete							
Experience >= 6	-28.7	12.2	-22.7	-35.0	-43.4	-45.2	133.3
Complete							
Experience <= 5							
Experience >= 6	-20.0	-8.3	27.3	-14.3	16.7	-35.7	-11.1
Secondary							
Incomplete							
Experience <= 5	-30.0	-42.9	0.0	350.0	-50.0	-33.3	-83.3
Experience >= 6	-15.7	-15.0	-12.8	-23.9	-12.9	-28.7	-11.7
Complete							
Experience <= 5	169.8	-57.8	244.9	10.7	-33.7	22.6	-7.2
Experience >= 6	45.0	-10.3	18.6	13.1	6.9	-3.6	-2.9
University							
Experience <= 5	3.1	71.0	0.9	41.3	-37.0	51.4	-16.5
Experience >= 6	-14.8	17.1	27.4	53.4	7.4	11.4	-13.8
Special							
Experience <= 5	47.8	-30.9	-47.2	93.5	-7.5	16.2	45.3
Experience >= 6	12.5	31.3	-6.3	-50.8	10.3	44.8	28.1
Experience (women):							
Experience <= 5	45.2	4.6	99.8	25.1	-2.5	-1.9	1.8
Experience >= 6	5.1	16.3	-7.4	63.8	20.5	-3.4	-2.2
Education and Experience (women):							
Basic							
Incomplete							
Experience >= 6	-50.0	7.1	0.0	-20.0	-66.7	50.0	-50.0
Complete							
Experience <= 5	---	---	---	---	---	---	---
Experience >= 6	---	-100.0	---	---	---	-100.0	---
Secondary							
Incomplete							
Experience <= 5	-20.0	-25.0	133.3	14.3	-100.0	ERR	2900.0
Experience >= 6	-9.5	-15.8	-50.0	-6.2	-6.7	-42.9	25.0
Complete							
Experience <= 5	38.5	-7.8	245.8	36.9	-34.6	17.5	-5.3
Experience >= 6	13.5	10.6	-7.2	78.1	1.4	-1.1	-17.7
University							
Experience*=5	21.0	74.0	79.0	25.1	-0.9	-1.3	-30.7
Experience >= 6	22.1	43.8	-7.9	75.5	41.4	-11.0	3.9
Special							
Experience <= 5	86.4	-55.4	58.7	4.8	67.6	-21.0	116.6
Experience >= 6	-7.0	2.5	24.4	35.3	42.0	21.4	18.5

Note: Data pertains only to employed workers.

Table lb

Relative Supply Share Changes, 1960-92
(broad supply measure)

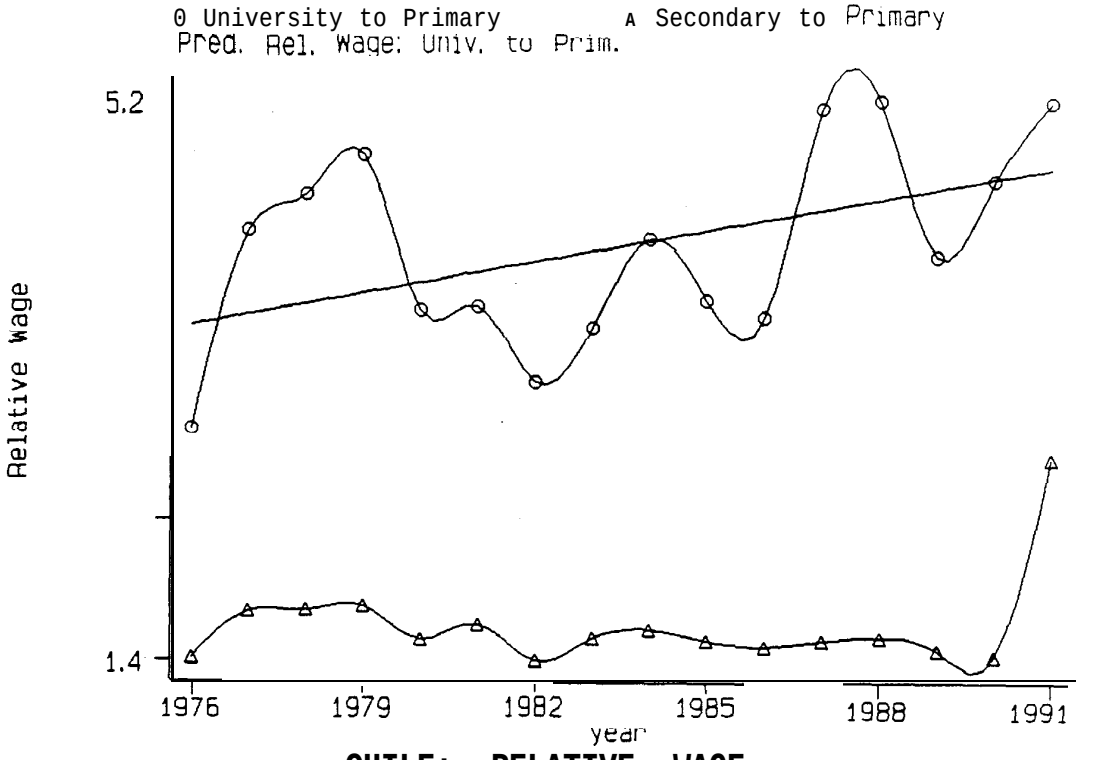
Group	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-92
Gender:							
Men	-2.3	-2.2	6.9	-8.7	-10.1	-14.5	10.1
Women	-13.9	9.7	-8.8	12.9	1.4	2.8	-4.1
Education							
Primary							
Incomplete	-4.3	-5.6	0.8	-14.5	-19.0	-27.3	15.9
Complete	-14.3	16.7	42.9	40.0	7.1	0.0	-6.7
Secondary							
Incomplete	-12.9	4.9	2.4	-1.1	11.6	-4.2	1.1
Complete	51.1	15.0	43.8	22.3	20.8	16.9	-0.5
University	-16.7	42.9	41.1	22.8	12.8	15.7	-5.6
Special	43.1	12.3	-6.1	-22.1	41.7	16.5	37.4
Experience (men):							
Experience <= 5	8.0	45.7	26.6	22.1	-15.4	31.1	1.5
Experience >= 6	-2.3	2.6	13.4	-2.8	1.3	-2.8	4.6
Education and Experience (men):							
Basic							
Incomplete							
Experience >= 6	-3.4	-5.9	2.3	-14.6	-18.7	-28.8	18.1
Complete							
Experience <= 5	-100.0	---	50.0	-33.3	-50.0	-100.0	...
Experience >= 6	-9.1	0.0	60.0	37.5	9.1	0.0	-4.2
Secondary							
Incomplete							
Experience <= 5	-93.8	60.0	87.5	113.3	-31.3	-22.7	11.8
Experience >= 6	-12.1	3.3	3.1	-3.8	11.9	-2.1	1.4
Complete							
Experience <= 5	254.5	-28.2	271.4	60.6	19.2	-1.5	-6.6
Experience >= 6	55.0	14.5	39.7	15.9	21.6	17.7	2.4
University							
Experience <= 5	17.2	76.7	34.9	12.9	-35.5	57.6	-1.4
Experience >= 6	-22.0	32.1	41.7	25.4	23.0	12.5	-5.9
Special							
Experience <= 5	41.5	8.0	-43.2	28.3	62.7	7.8	17.9
Experience >= 6	35.3	27.5	9.1	-47.9	14.0	54.4	22.7
Experience (women):							
Experience <= 5	52.7	27.5	100.8	12.7	11.8	2.0	4.0
Experience >= 6	-2.7	22.4	-10.1	33.2	23.4	5.1	0.0
Education and Experience (women):							
Basic							
Incomplete							
Experience >= 6	-20.7	2.1	-28.6	-8.6	-25.0	-8.3	-9.1
Complete							
Experience <= 5	---	---	---	---	---	---	---
Experience >= 6	0.0	0.0	0.0	200.0	0.0	0.0	-33.3
Secondary							
Incomplete							
Experience <= 5	0.0	200.0	50.0	44.4	-53.8	50.0	-22.2
Experience>= 6	-14.3	16.7	-23.8	31.3	23.8	-23.1	0.0
Complete							
Experience <= 5	100.0	-2.9	324.2	26.4	8.5	22.9	-19.9
Experience >= 6	17.8	28.3	8.8	63.5	19.0	18.8	-8.8
University							
Experience <= 5	22.0	90.3	97.8	9.2	3.4	1.0	-23.3
Experience >= 6	33.3	75.0	-1.8	56.4	55.8	-3.7	4.7
Special							
Experience <= 5	73.6	-14.1	16.5	-1.1	54.9	-26.2	141.3
Experience >= 6	46.2.	26.3	4.2	4.0	57.7	19.5	28.6

Note: Data pertains to employed workers, self-employed persons, proprietors, and unpaid family labor.

Table 2

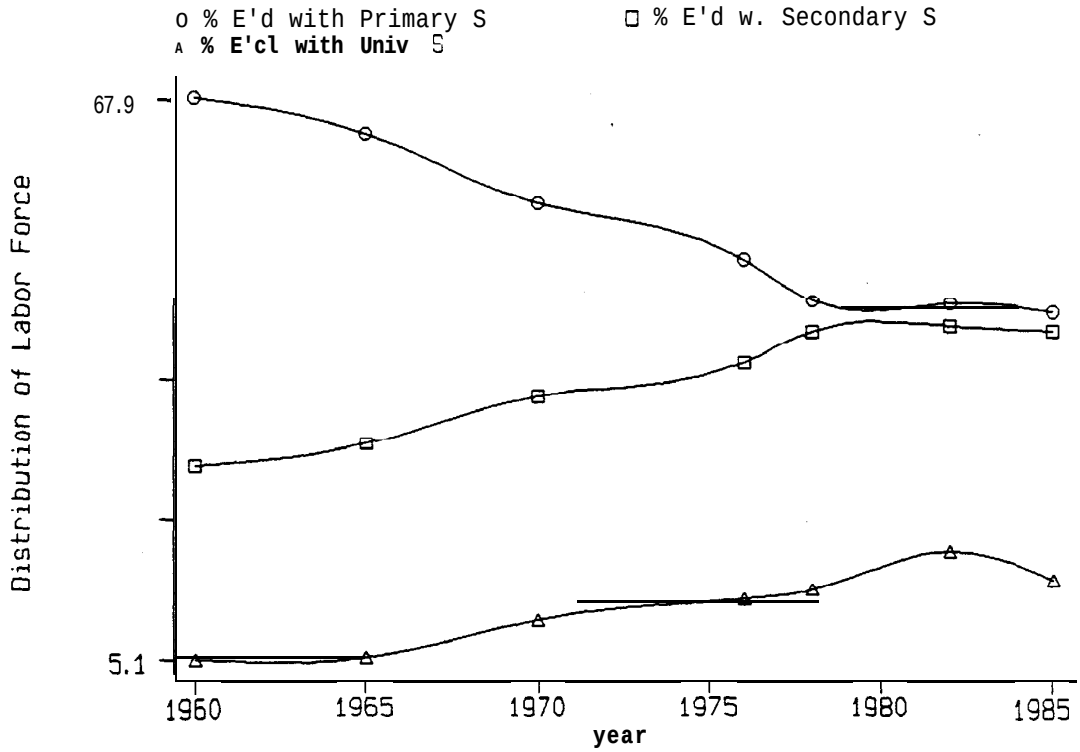
Wage-Ueighted Shares of Employees
(efficiency units)

Group	1970						1980						1990					
	obs.		Mean		M-u Sh		Obs.		Mean		M-Wage Share		Obs.		Mean		M-U Shar	
	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P
All					1.002	1.008					1.007	1.008					0.965	1.004
Gender:																		
Hen	48	48			0.864													
Women	46	48	0.003	0.016 0.003	0.138	0.864 0.144	46 45	48	0.017 0.005	0.018 0.003	0.782 0.225	0.864 0.144	45 40	47	0.017 0.005	0.017 0.004	0.765 0.2	0.816 0.188
Education																		
Primary																		
Incomplete	16	16	0.012	0.03	0.192	0.48	14	16	0.005	0.021	0.07	0.336	9	15	0.002	0.011	0.018	0.165
Complete																		
Secondary																		
Incomplete	16	16																
Complete	16	16	0.005 0.015	0.005 0.01	0.05 0.24	0.08 0.16	15	15	0.003 0.017	0.004 0.014	0.048 0.272	0.064 0.224	15 16	16	0.002 0.016	0.004 0.018	0.256 0.03	0.288
University	16	16	0.024	0.014	0.384	0.226	16	16	0.034	0.02	0.541	0.32	16	lb	0.039	0.025	0.624	0.4
Special	16	16	0.006	0.004	0.096	0.064	16	16	0.004	0.003	0.064	0.048	16	lb	0.005	0.004	0.08	0.064



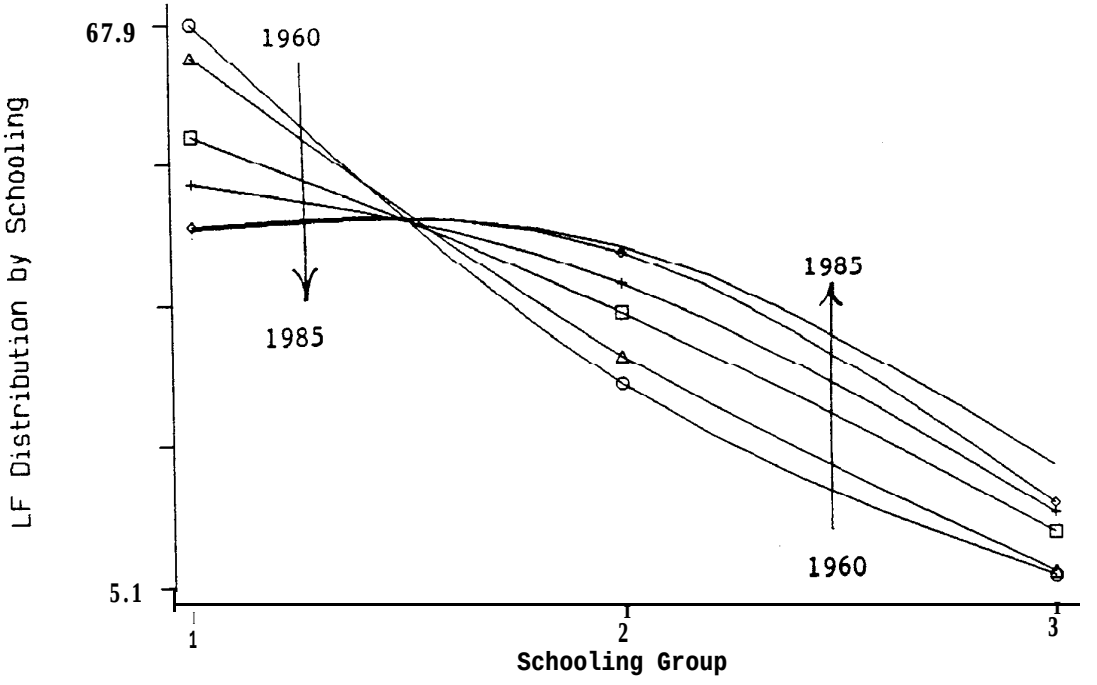
CHILE: RELATIVE WAGE

Figure 1



DISTRIBUTION OF LABOR FORCE BY SCHOOLING

Figure 2



EDUCATION EXPANSION: 1960-1985

Figure 3

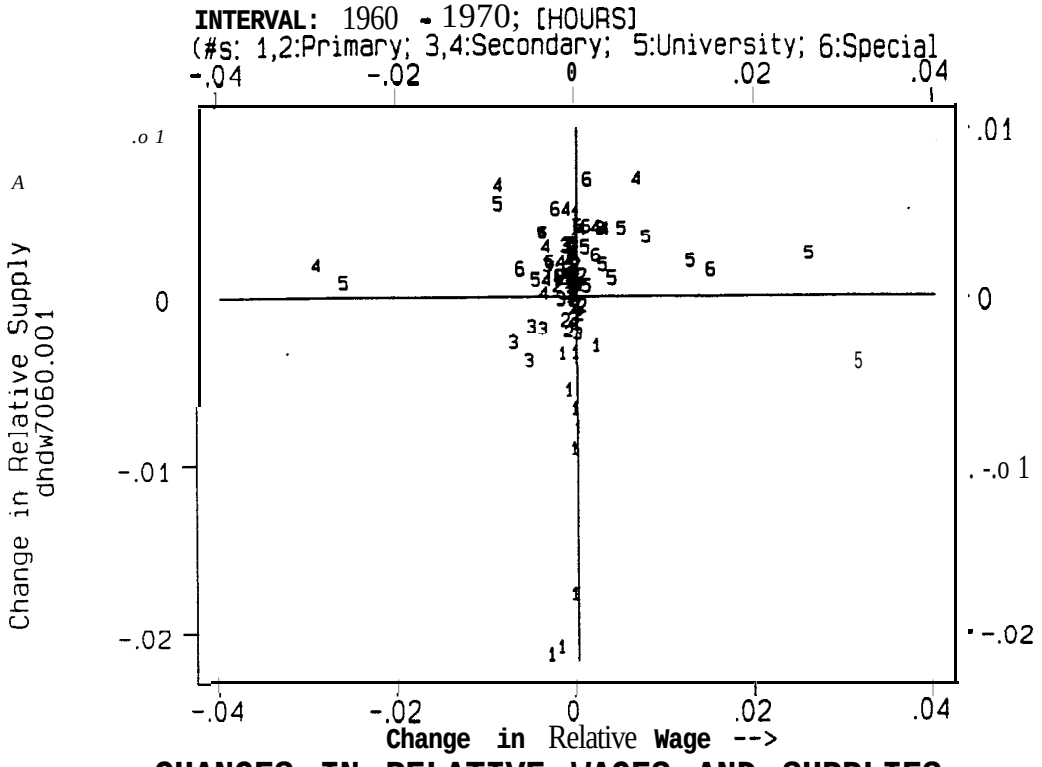

INTERVAL: 1960 - 1970; [HOURS]
(#s: 1,2:Primary; 3,4:Secondary; 5:University; 6:Special
Change in Relative Supply
dhdw7060.001
Change in Relative Wage -->
CHANGES IN RELATIVE WAGES AND SUPPLIES
Stata

Figure 4

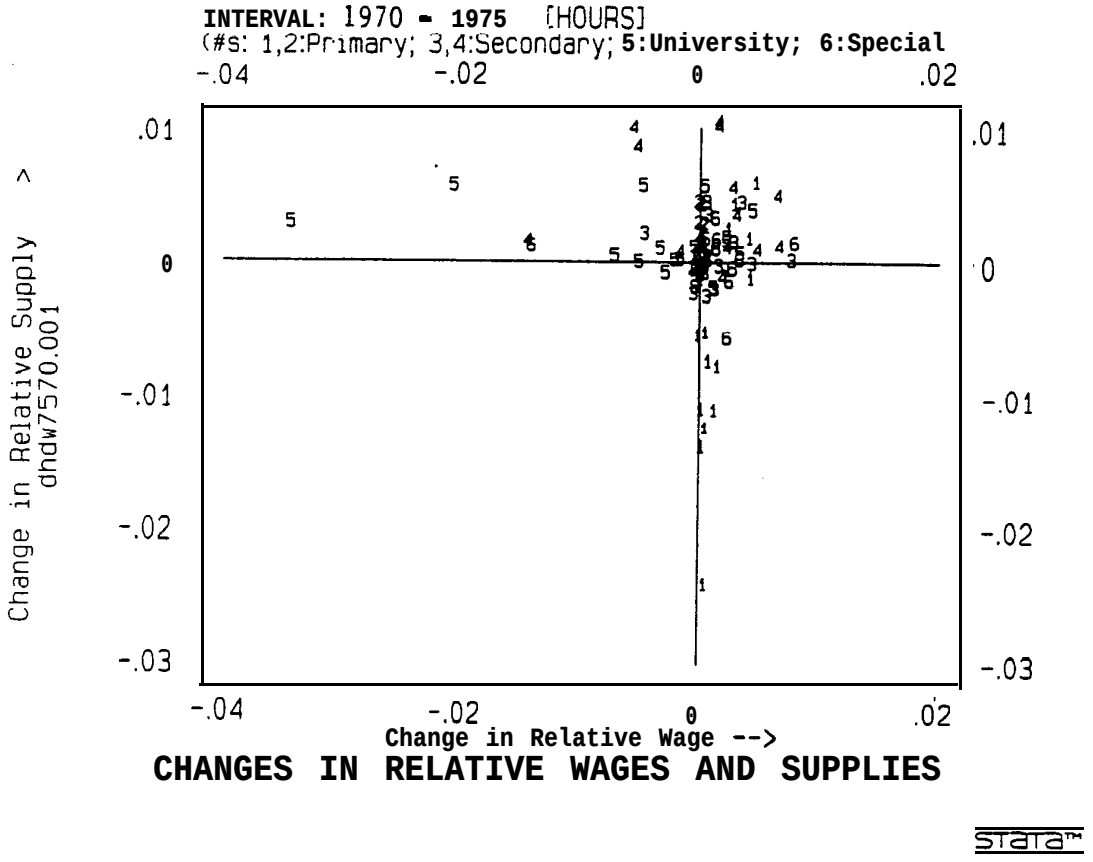
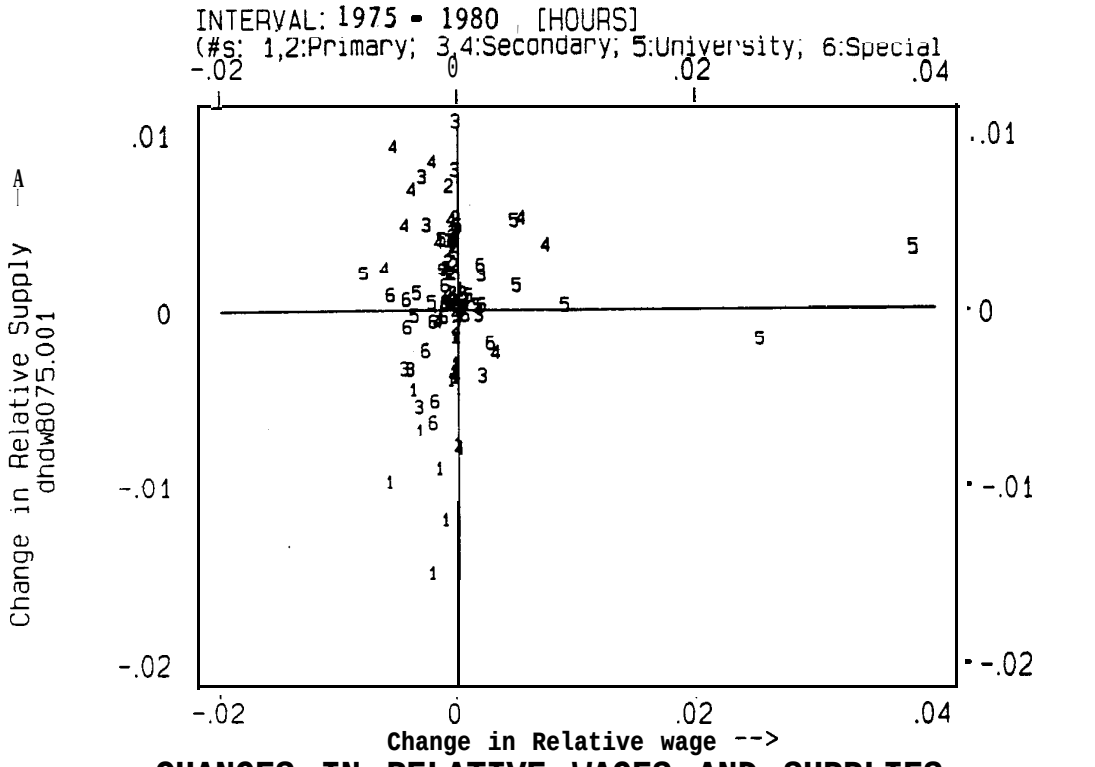
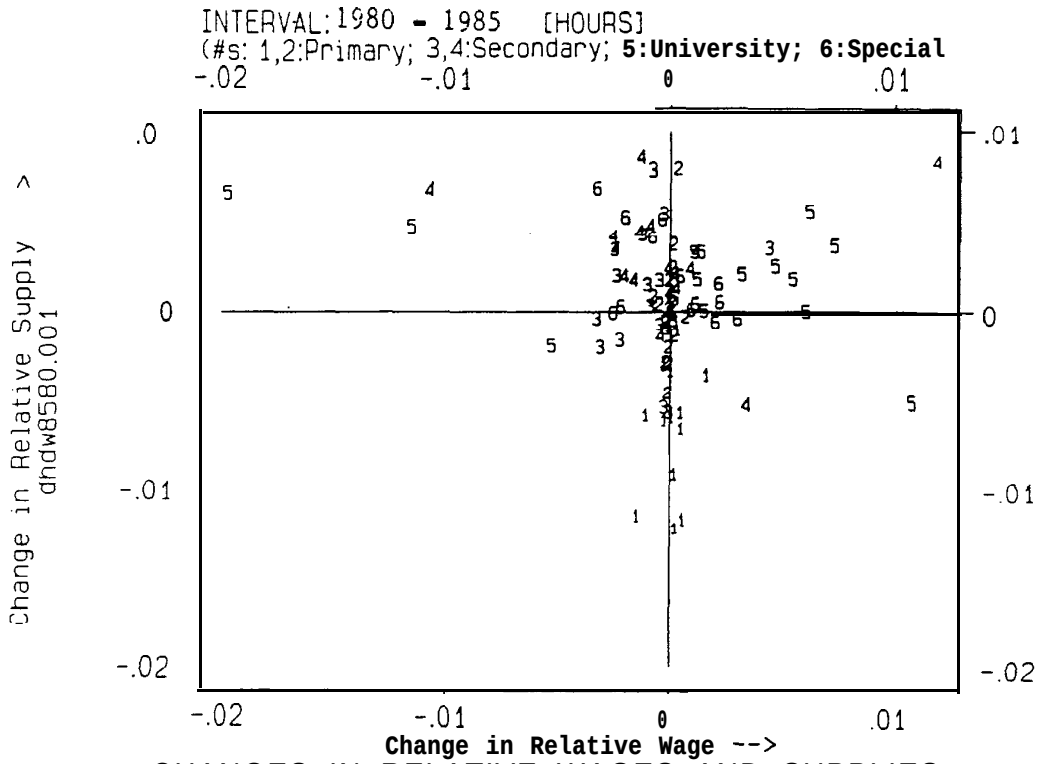

INTERVAL: 1970 - 1975 [HOURS]
(#s: 1,2:Primary; 3,4:Secondary; 5:University; 6:Special
-.04
-.02
0
.02
.01
0
-.01
-.02
-.03
Change in Relative Supply >
dhdw7570.001
Change in Relative Wage -->
CHANGES IN RELATIVE WAGES AND SUPPLIES
stata™

Figure 5



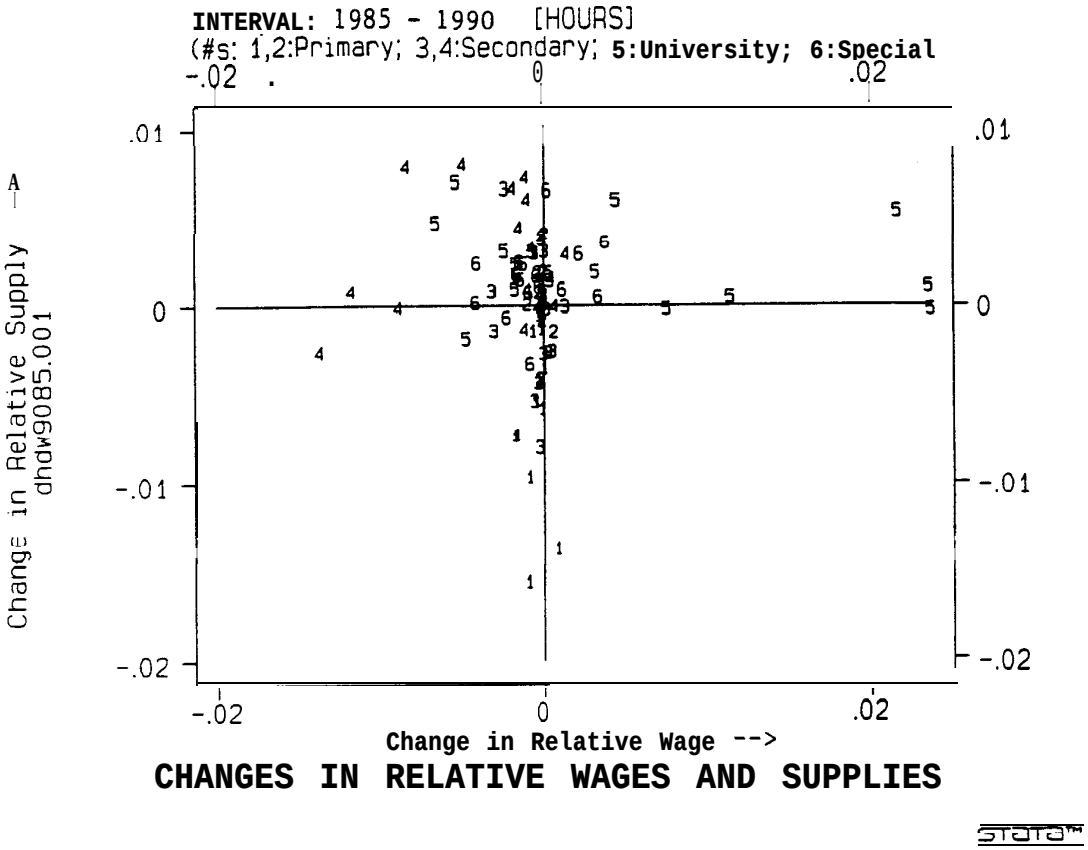
CHANGES IN RELATIVE WAGES AND SUPPLIES

Figure 6



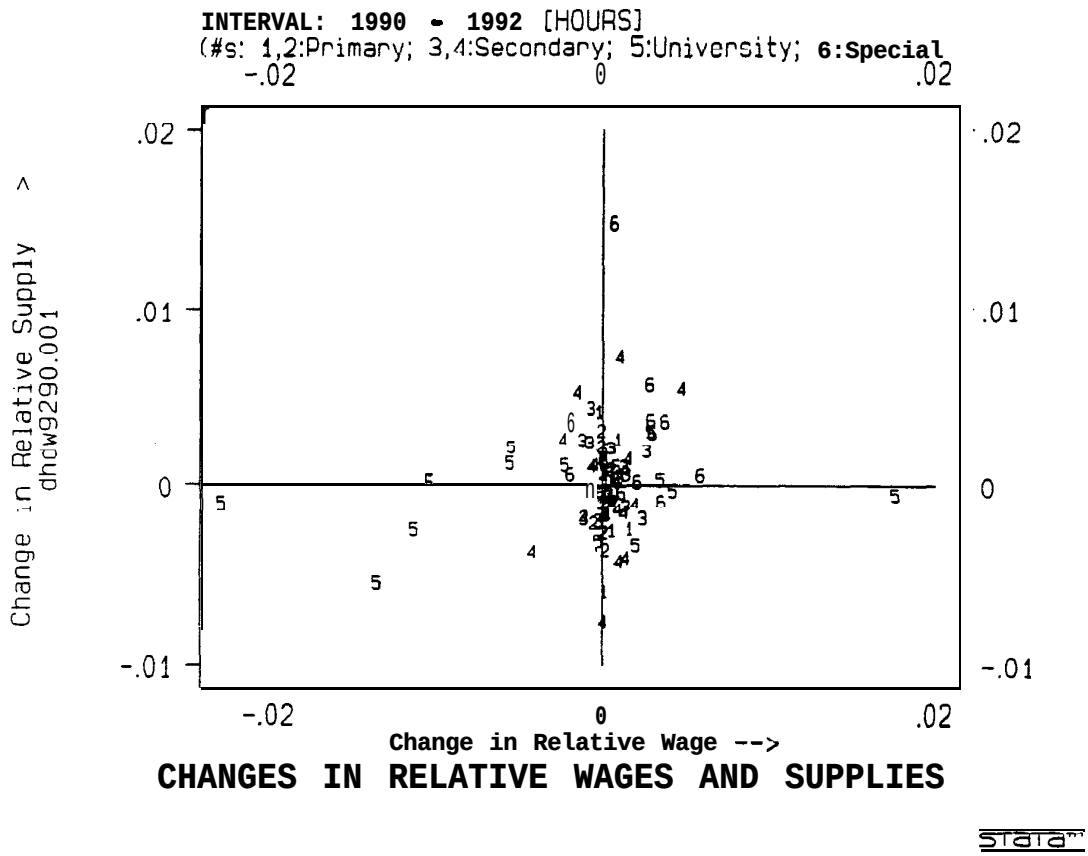
CHANGES IN RELATIVE WAGES AND SUPPLIES

Figure 7



CHANGES IN RELATIVE WAGES AND SUPPLIES

Figure 8



CHANGES IN RELATIVE WAGES AND SUPPLIES

Figure 9

FIGURES 3

GROUP B

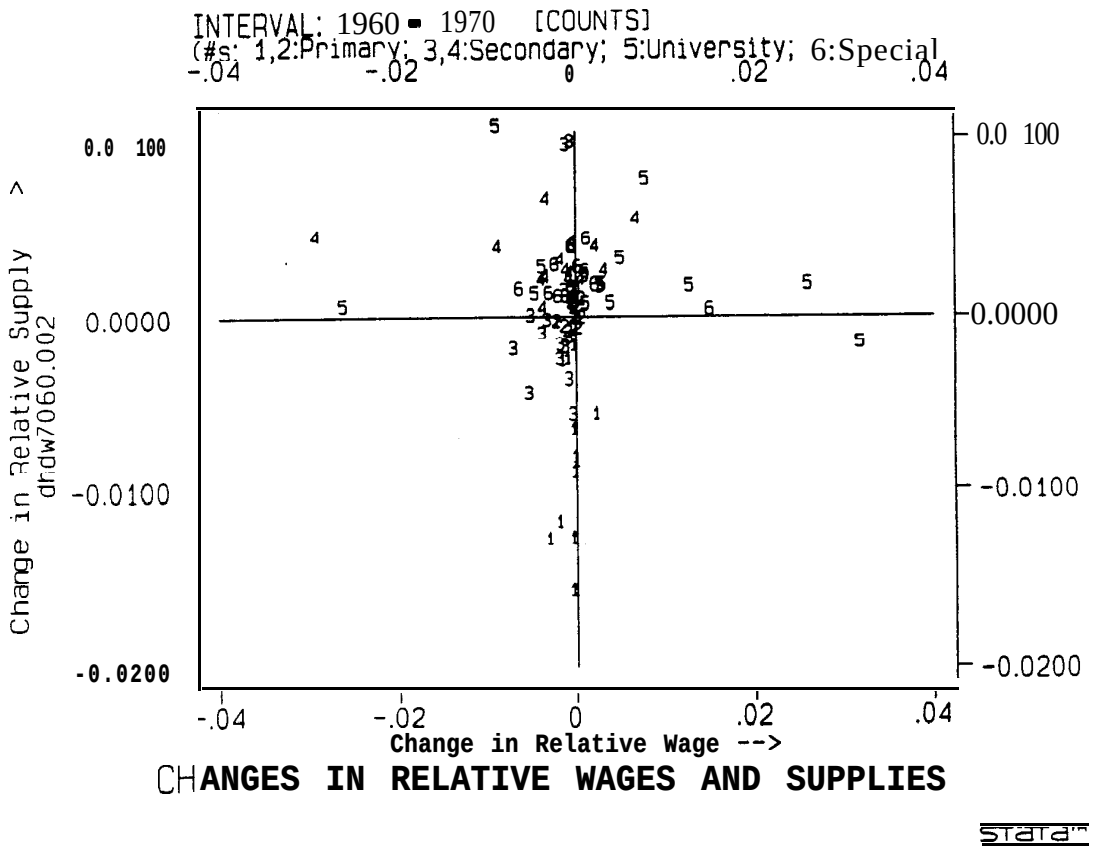

INTERVAL: 1960 - 1970 [COUNTS]
(#s: 1,2:Primary; 3,4:Secondary; 5:University; 6:Special
-.04
-.02
0
.02
.04
0.0 100
0.0000
-0.0100
-0.0200
Change in Relative Supply -->
drdw7060.002
Change in Relative Wage -->
CHANGES IN RELATIVE WAGES AND SUPPLIES
Stata

Figure 10

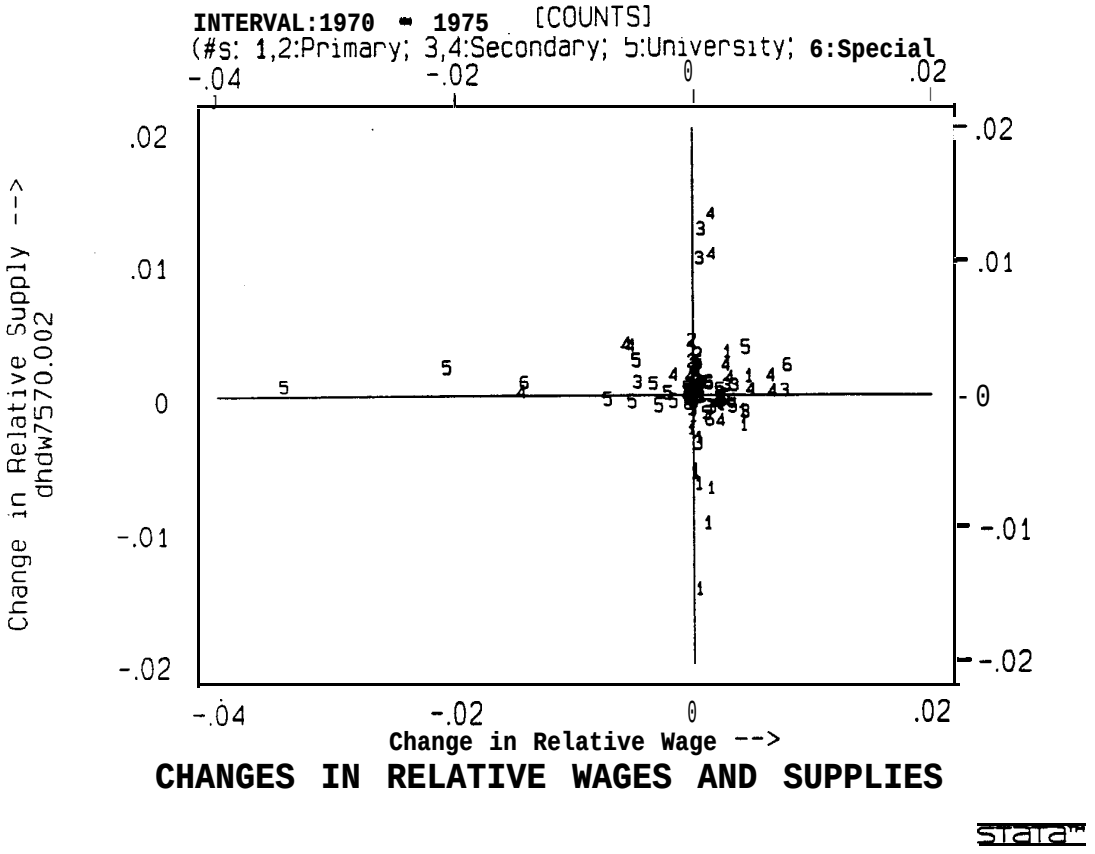
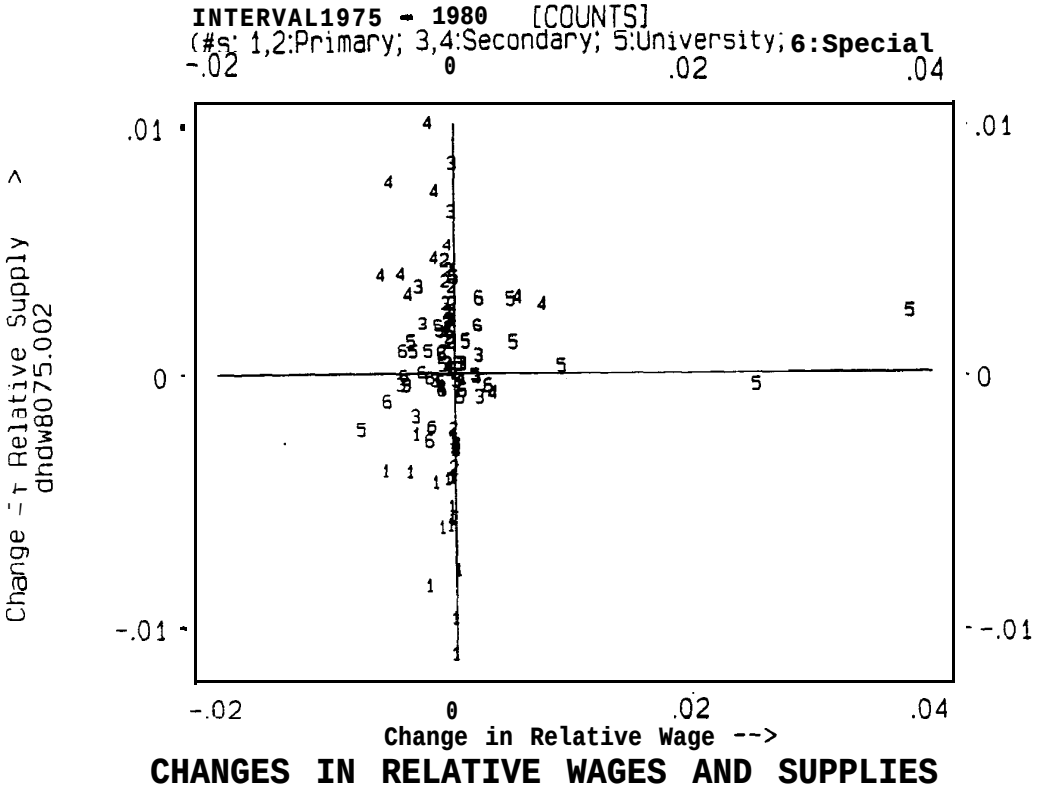

INTERVAL:1970 - 1975 [COUNTS]
(#s: 1,2:Primary; 3,4:Secondary; 5:University; 6:Special
-.04
-.02
0
.02
.02
.01
0
-.01
-.02
Change in Relative Supply -->
dhdw7570.002
Change in Relative Wage -->
CHANGES IN RELATIVE WAGES AND SUPPLIES
Stata

Figure 11



CHANGES IN RELATIVE WAGES AND SUPPLIES

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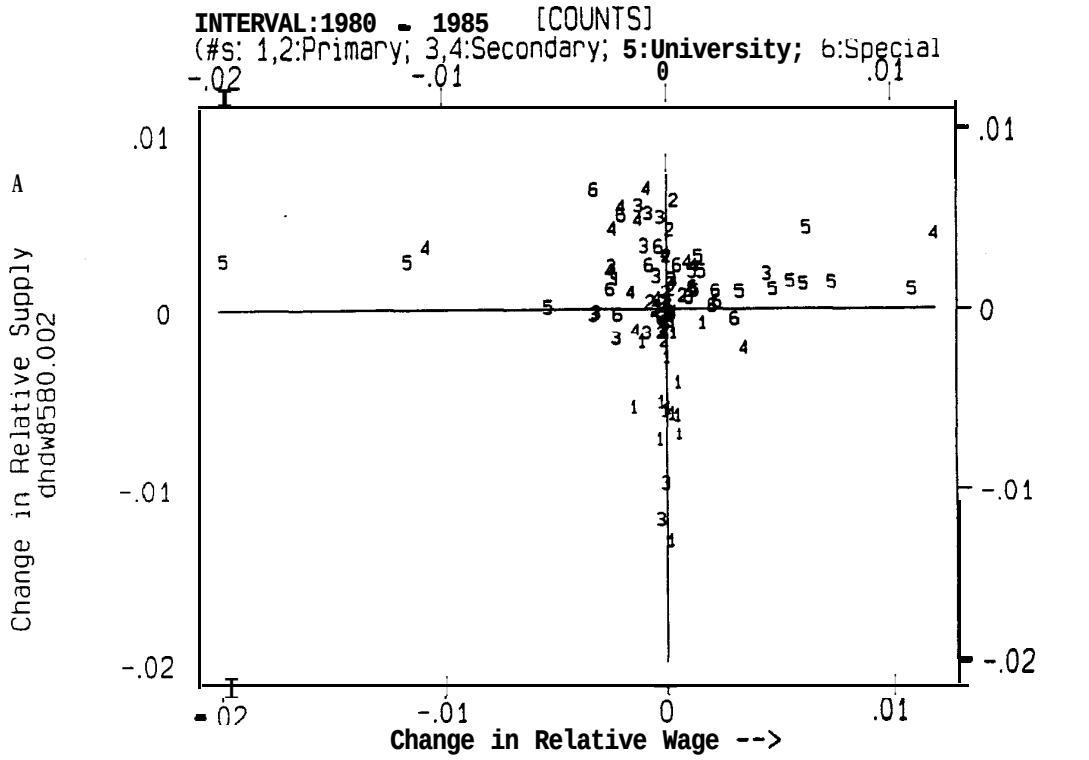
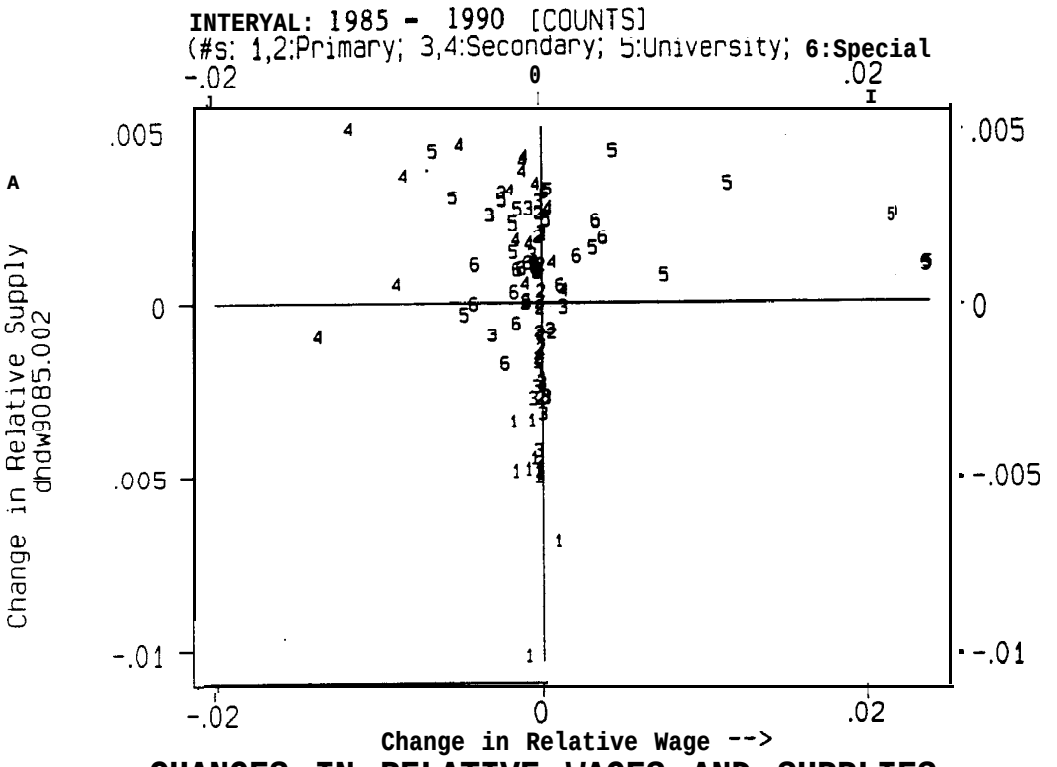
Figure 12



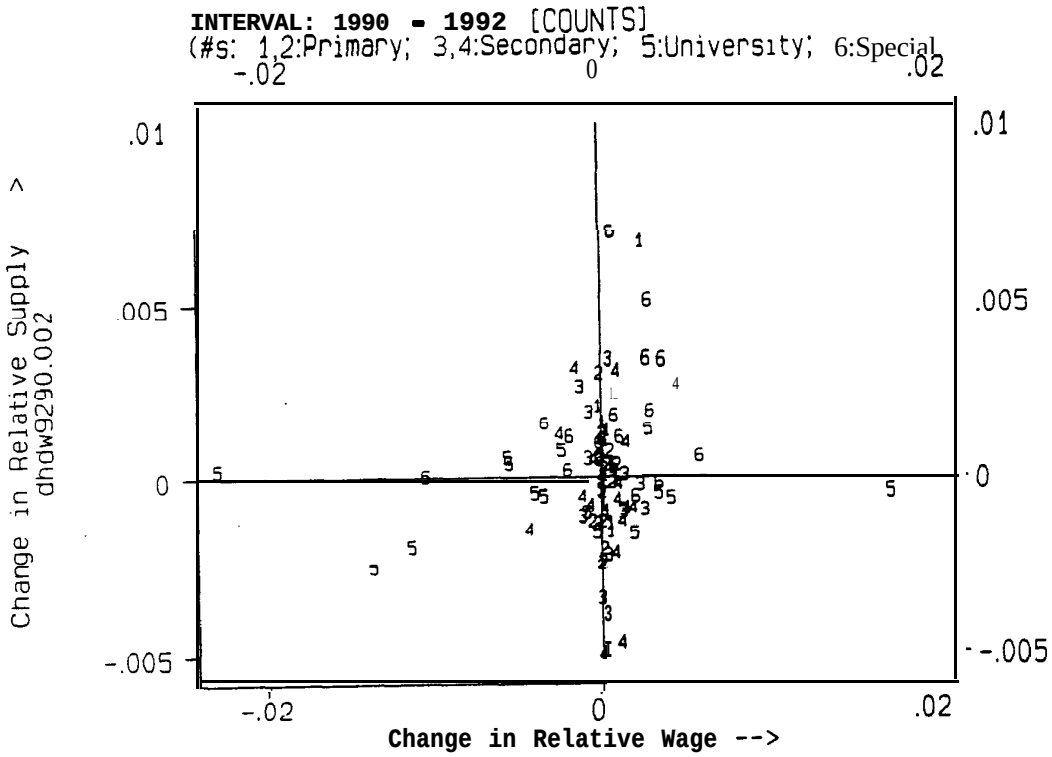
CHANGES IN RELATIVE WAGES AND SUPPLIES

Figure 13



CHANGES IN RELATIVE WAGES AND SUPPLIES

Figure 14



CHANGES IN RELATIVE WAGES AND SUPPLIES

Figure 15